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Includes aeronautics (general); aerodynamics; air transportation and safety; aircraft communications and navigation; aircraft design, testing and performance; aircraft instrumentation; aircraft propulsion and power; aircraft stability and control; and research and support facilities (air).

For related information see also *Astronautics*.

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For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer.*

## SOCIAL SCIENCES

Includes social sciences (general); administration and management; documentation and information science; economics and cost analysis; law and political science; and urban technology and transportation.

**80 SOCIAL SCIENCES (GENERAL)** **N.A.**
Includes educational matters.

**81 ADMINISTRATION AND MANAGEMENT** **1281**
Includes management planning and research.

**82 DOCUMENTATION AND INFORMATION SCIENCE** **1282**
Includes information storage and retrieval technology; micrography; and library science.
For computer documentation see *61 Computer Programming and Software.*

**83 ECONOMICS AND COST ANALYSIS** **N.A.**
Includes cost effectiveness studies.

**84 LAW AND POLITICAL SCIENCE** **N.A.**
Includes space law; international law; international cooperation; and patent policy.

**85 URBAN TECHNOLOGY AND TRANSPORTATION** **1286**
Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.
For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

**SPACE SCIENCES**

Includes space sciences (general); astronomy; astrophysics; lunar and planetary exploration; solar physics; and space radiation.
For related information see also *Geosciences.*

**88 SPACE SCIENCES (GENERAL)** **1287**

**89 ASTRONOMY** **1290**
Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

**90 ASTROPHYSICS** **1291**
Includes cosmology; and interstellar and interplanetary gases and dust.

**91 LUNAR AND PLANETARY EXPLORATION** **1293**
Includes planetology; and manned and unmanned flights.
For spacecraft design see *18 Spacecraft Design, Testing and Performance.* For space stations see *15 Launch Vehicles and Space Vehicles.*

**92 SOLAR PHYSICS** **1294**
Includes solar activity, solar flares, solar radiation and sunspots.

**93 SPACE RADIATION** **N.A.**
Includes cosmic radiation; and inner and outer earth's radiation belts.
For biological effects of radiation see *52 Aerospace Medicine.* For theory see *73 Nuclear and High-Energy Physics.*

**GENERAL**

**99 GENERAL** **1294**

**Note: N.A. means that no abstracts were assigned to this category for this issue.**

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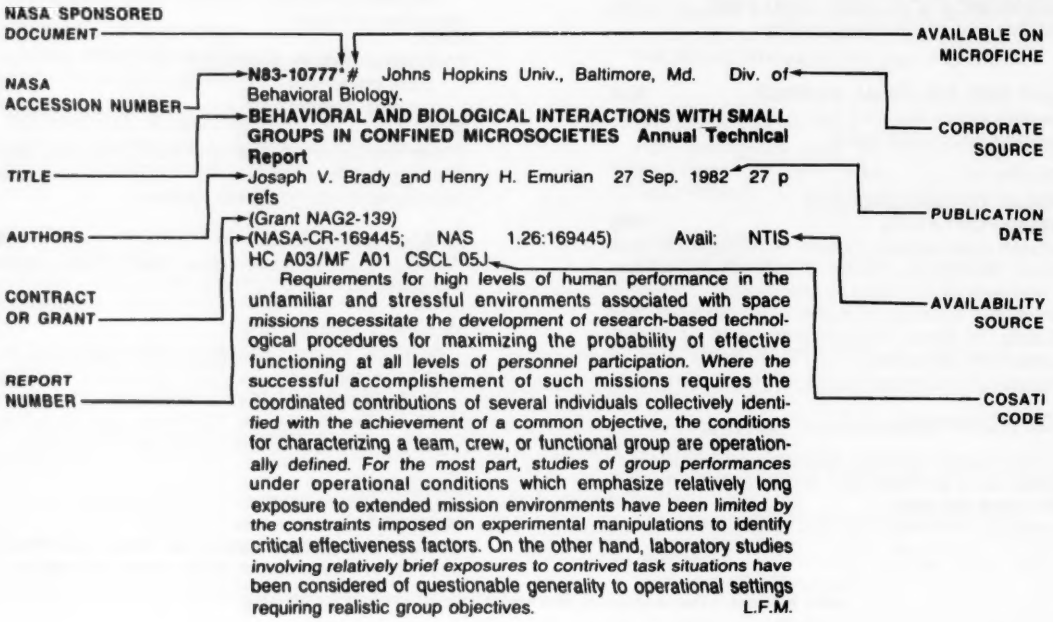
**PERSONAL AUTHOR INDEX** ..... **I-67**
**CORPORATE SOURCE INDEX** ..... **I-77**
**CONTRACT NUMBER INDEX** ..... **I-93**
**REPORT / ACCESSION NUMBER INDEX** ..... **I-97**

# TYPICAL CITATION AND ABSTRACT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N83-10777*# Johns Hopkins Univ., Baltimore, Md. Div. of Behavioral Biology.
CORPORATE SOURCE
TITLE
BEHAVIORAL AND BIOLOGICAL INTERACTIONS WITH SMALL GROUPS IN CONFINED MICROSOCIETIES Annual Technical Report
AUTHORS
Joseph V. Brady and Henry H. Emurian 27 Sep. 1982 27 p refs
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(NASA-CR-169445; NAS 1.26:169445) Avail: NTIS HC A03/MF A01 CSCL 05J
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Requirements for high levels of human performance in the unfamiliar and stressful environments associated with space missions necessitate the development of research-based technological procedures for maximizing the probability of effective functioning at all levels of personnel participation. Where the successful accomplishement of such missions requires the coordinated contributions of several individuals collectively identified with the achievement of a common objective, the conditions for characterizing a team, crew, or functional group are operationally defined. For the most part, studies of group performances under operational conditions which emphasize relatively long exposure to extended mission environments have been limited by the constraints imposed on experimental manipulations to identify critical effectiveness factors. On the other hand, laboratory studies involving relatively brief exposures to contrived task situations have been considered of questionable generality to operational settings requiring realistic group objectives. L.F.M.

VOLUME 21 NUMBER 8/APRIL 23, 1983

# Scientific and Technical Aerospace Reports

*A Semimonthly Publication of the National Aeronautics and Space Administration*

## 01 AERONAUTICS (GENERAL)

**N83-17449*** National Aeronautics and Space Administration, Washington, D. C.

**AERONAUTICAL ENGINEERING. A CONTINUING BIBLIOGRAPHY WITH INDEXES, SUPPLEMENT 156**

Jan. 1983 93 p

(NASA-SP-7037(156); NAS 1.21:7037(156)) Avail: NTIS HC $5.00 CSCL 01A

This bibliography lists 288 reports, articles and other documents introduced into the NASA scientific and technical information system in December 1982. Author

**N83-17450*#** *Arinc Research Corp., Annapolis, Md.*

**ANALYSIS AND METHODOLOGY FOR AERONAUTICAL SYSTEMS TECHNOLOGY PROGRAM PLANNING** ***Final Report***

M. J. White, I. Gershkoff, and S. Lamkin Jan. 1983 203 p refs (Contract NAS1-16261)

(NASA-CR-166036; NAS 1.26:166036) Avail: NTIS HC A10/MF A01 CSCL 01B

A structured methodology was developed that allows the generation, analysis, and rank-ordering of system concepts by their benefits and costs, indicating the preferred order of implementation. The methodology is supported by a base of data on civil transport aircraft fleet growth projections and data on aircraft performance relating the contribution of each element of the aircraft to overall performance. The performance data are used to assess the benefits of proposed concepts. The methodology includes a computer program for performing the calculations needed to rank-order the concepts and compute their cumulative benefit-to-cost ratio. The use of the methodology and supporting data is illustrated through the analysis of actual system concepts from various sources. Author

**N83-17451*#** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

**OPTIMAL SHORT-RANGE TRAJECTORIES FOR HELICOPTERS**

G. L. Slater (Cincinnati Univ., Ohio) and H. Erzberger Dec. 1982 51 p refs

(NASA-TM-84303; A-9132; NAS 1.15:84303) Avail: NTIS HC A04/MF A01 CSCL 01B

An optimal flight path algorithm using a simplified altitude state model and a priori climb cruise descent flight profile was developed and applied to determine minimum fuel and minimum cost trajectories for a helicopter flying a fixed range trajectory. In addition, a method was developed for obtaining a performance model in simplified form which is based on standard flight manual data and which is applicable to the computation of optimal trajectories. The entire performance optimization algorithm is simple enough that on line trajectory optimization is feasible with a relatively small computer. The helicopter model used is the Silorsky S-61N. The results show that for this vehicle the optimal flight path and optimal cruise altitude can represent a 10% fuel saving on a minimum fuel trajectory. The optimal trajectories show considerable variability because of helicopter weight, ambient winds, and the relative cost trade off between time and fuel. In general, reasonable variations from the optimal velocities and cruise altitudes do not significantly degrade the optimal cost. For fuel optimal trajectories, the optimum cruise altitude varies from the maximum (12,000 ft) to the minimum (0 ft) depending on helicopter weight. S.L.

**N83-17452#** Office of Science and Technology, Washington, D.C.

**AERONAUTICAL RESEARCH AND TECHNOLOGY POLICY. VOLUME 1: SUMMARY REPORT**

Nov. 1982 39 p

Avail: NTIS HC A03/MF A01

Policies on aeronautical research and technology (R&T) are reviewed including current and future needs, capabilities, and incentives in both government and private industry. The appropriateness and effectiveness of U.S. aeronautical R&T policies, and the U.S. government's role in support of aeronautical R&T are discussed. The findings and recommendations are presented in the framework of an historical review of government policies and world events that influenced the development of U.S. aeronautics, and the civil competition and military threat resulting from R&D efforts in Europe and in the Soviet Union. It is concluded that significant potential improvement gains exist to warrant future research investment in both government and private industry; U.S. aeronautical facilities are adequate, however continued maintenance, improved productivity, and modernization are required; and procedures to control dissemination of DOD/NASA unclassified aeronautical technology data require further analysis and development. J.M.S.

**N83-17453*#** Neilsen Engineering and Research, Inc., Mountain View, Calif.

**DEVELOPMENT OF A MULTIPLE-PARAMETER NONLINEAR PERTURBATION PROCEDURE FOR TRANSONIC TURBOMACHINERY FLOWS: PRELIMINARY APPLICATION TO DESIGN/OPTIMIZATION PROBLEMS** ***Final Report***

S. S. Stahara, J. P. Elliott, and J. R. Spreiter Washington NASA Jan. 1983 120 p refs

(Contract NAS3-20836)

(NASA-CR-3657; E-1395; NAS 1.26:3657; NEAR-TR-276) Avail: NTIS HC A06/MF A01 CSCL 01A

An investigation was conducted to continue the development of perturbation procedures and associated computational codes for rapidly determining approximations to nonlinear flow solutions, with the purpose of establishing a method for minimizing computational requirements associated with parametric design studies of transonic flows in turbomachines. The results reported here concern the extension of the previously developed successful method for single parameter perturbations to simultaneous multiple-parameter perturbations, and the preliminary application of the multiple-parameter procedure in combination with an optimization method to blade design/optimization problem. In order

to provide as severe a test as possible of the method, attention is focused in particular on transonic flows which are highly supercritical. Flows past both isolated blades and compressor cascades, involving simultaneous changes in both flow and geometric parameters, are considered. Comparisons with the corresponding exact nonlinear solutions display remarkable accuracy and range of validity, in direct correspondence with previous results for single-parameter perturbations. B.W.

**N83-17454*#** Operations Research, Inc., Silver Spring, Md.
**RESEARCH AND TECHNOLOGY PROGRAM PERSPECTIVES FOR GENERAL AVIATION AND COMMUTER AIRCRAFT Final Report**
James S. Bauchspies and William E. Simpson Sep. 1982 157 p refs
(Contract NASw-3554)
(NASA-CR-169875; NAS 1.26:169875; TR-2101) Avail: NTIS HC A08/MF A01 CSCL 01B

The uses, benefits, and technology needs of the U.S. general aviation industry were studied in light of growing competition from foreign general aviation manufacturers, especially in the commuter and business jet aircraft markets. Author

**N83-17455#** Department of Energy, Washington, D. C.
**SYMPOSIUM ON COMMERCIAL AVIATION ENERGY CONSERVATION STRATEGIES. PAPERS AND PRESENTATIONS**
Apr. 1981 385 p refs Symp. held in Washington, D.C., 2-3 Apr. 1981 Sponsored in cooperation with FAA
(AD-A107106) Avail: NTIS HC A17/MF A01 CSCL 01/2

Current and future efforts to conserve fuel and to promote energy conservation within the commercial aviation sector were discussed. Energy conservation programs such as flight operations, air traffic control, engineering and maintenance, and corporate management strategies are included. For individual titles, see N83-17456 through N83-17469.

**N83-17456#** Aerospace Corp., El Segundo, Calif.
**POTENTIAL FUEL SAVINGS THROUGH IMPROVED AIRFRAME MAINTENANCE**
R. R. Covey, B. M. Pershing, and R. S. Knight (Continental Airlines) *In* DOE Symp. on Com. Aviation Energy Conserv. Strategies Apr. 1981 p 3-30 refs (For primary document see N83-17455 08-01)
Avail: NTIS HC A17/MF A01 CSCL 01/2

Potential fuel savings obtainable through improved airframe maintenance of commercial jet transport aircraft was studied. In the two-task program, one task developed and utilized methods to project analytically the potential improved airframe maintenance-related savings of each aircraft in a fleet of 15 DC-10's. These projections were formulated using a discrepancy data base developed from detailed physical inspections of each aircraft. The second task addressed the verification of fuel savings through the collection and analysis of pre- and post-maintenance flight performance data obtained on two of the DC-10's while in normal revenue service. Based on multivariable linear regression analyses of the flight data, one aircraft showed a decrease in fuel consumption of 0.4 percent at a confidence level in excess of 98 percent, compared to an analytical projection of 0.6 percent. Flight verification results from the second aircraft were inconclusive due to collection of a significant block of data under unstable flight conditions. Author

**N83-17457#** Neilsen Engineering and Research, Inc., Mountain View, Calif.
**DEVELOPMENT OF A PROCEDURE FOR CALCULATING THE EFFECTS OF AIRFOIL EROSION ON AIRCRAFT ENGINE COMPRESSOR PERFORMANCE c07**
O. J. McMillan *In* DOE Symp. on Com. Aviation Energy Conserv. Strategies Apr. 1981 p 31-44 refs (For primary document see N83-17455 08-01)
(Contract DE-AC03-79CS-50095)
Avail: NTIS HC A17/MF A01 CSCL 01/2

Maximizing the fuel efficiency of the low-bypass turbofan, the JJ8D, through proper maintenance is addressed. Determining how much of an increase in fuel consumption is associated with a particular kind of JJ8D geometry change was considered. A procedure to allow the detailed assessment of the effects of fan or compressor airfoil erosion on JJ8D fuel consumption was developed. Author

**N83-17458#** Peat, Marwick, Mitchell and Co., San Francisco, Calif.
**AIRCRAFT TOWING FEASIBILITY STUDY c05**
Henry S. L. Fan and Dan G. Haney *In* DOE Symp. on Com. Aviation Energy Conserv. Strategies Apr. 1981 p 45-56 refs (For primary document see N83-17455 08-01)
Avail: NTIS HC A17/MF A01 CSCL 01/2

The feasibility and constraints of towing aircraft between runways and terminal gate areas as a fuel conservation measure were studied. Author

**N83-17459#** Systems Control, Inc., West Palm Beach, Fla. Technology Industries Div.
**THE ANALYSIS OF INTEGRATED FUEL EFFICIENT, LOW NOISE PROCEDURES IN LAX TERMINAL AREA OPERATIONS c04**
John B. McKinley and Robert L. Bowles (FAA) *In* DOE Symp. on Com. Aviation Energy Conserv. Strategies Apr. 1981 p 57-78 refs Originally announced as N82-13014 (For primary document see N83-17455 08-01)
Avail: NTIS HC A17/MF A01 CSCL 01/2

Terminal area fuel conservation and airport noise level relationships are investigated. The potential fuel savings and noise level reduction in the Los Angeles International (LAX) terminal area were quantified. Relaxation of current noise abatement procedure without impacting 1980 noise levels, and at the same time conserving additional fuel was determined. Author

**N83-17460#** Federal Aviation Administration, Washington, D.C. Energy Div.
**AN OVERVIEW OF THE DOT/FAA AVIATION ENERGY CONSERVATION POLICY c44**
Charles J. Hoch *In* DOE Symp. on Com. Aviation Energy Conserv. Strategies Apr. 1981 p 79-94 (For primary document see N83-17455 08-01)
Avail: NTIS HC A17/MF A01 CSCL 01/2

An overview of the FAA aviation energy conservation policy is presented. N.W.

**N83-17461*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
**AIRLINE FLIGHT PLANNING: THE WEATHER CONNECTION c04**
Robert Steinberg *In* DOE Symp. on Com. Aviation Energy Conserv. Strategies Apr. 1981 p 103-126 refs Previously announced as A82-24386 (For primary document see N83-17455 08-01)
Avail: NTIS HC A17/MF A01 CSCL 01/2

Airline flight planning has shown little improvement in accuracy since the introduction of computerized techniques in 1964. This has primarily been, because both the type of weather product utilized by the carriers and the way they have employed it has remained unchanged over the past 15 years. The airlines now have an opportunity to make a significant advance in this area with attendant benefits in fuel savings. Most the technological ingredients are in place, but it will take increased cooperation between government and the private sector if cost effective improvements are to be made on a reasonable time scale. This paper reviews the meteorological basis for the present method of flight planning and analyzes its impact on current flight operations. A new approach is suggested for developing a weather data base, for flight planning, which has the potential of providing a fuel savings of between 2 and 3 percent on long distance flights. Author

**N83-17462#** United Air Lines, Inc., Denver, Colo. Flight Standards and Procedures Dept.
**FLIGHT PREPARATION AND PLANNING**
Brooks Schooley *In* DOE Symp. on Com. Aviation Energy Conserv.

Strategies Apr. 1981 p 127-136 (For primary document see N83-17455 08-01)
Avail: NTIS HC A17/MF A01 CSCL 01/2

The United Airlines database, from which fuel efficient flight plans are constructed is discussed. N.W.

**N83-17463#** Northwest Airlines, Inc., Minneapolis, Minn.
**FUEL CONSERVATION TECHNIQUES IN JET TRANSPORT AIRCRAFT OPERATIONS** c03
H. H. Craven, Jr. *In* DOE Symp. on Com. Aviation Energy Conserv. Strategies Apr. 1981 p 137-146 (For primary document see N83-17455 08-01)
Avail: NTIS HC A17/MF A01 CSCL 01/2

Fuel economy and aerodynamic efficiency in jet transport aircraft operations are discussed. The operational procedures recommended by the aircraft manufacturers were examined, and reasonable alternatives when ATC or flight conditions make those procedures either impractical or impossible are suggested. Basic aerodynamic considerations and their effects on engine and aerodynamic efficiency are emphasized. A density altitude chart with weight limitations for the B-747-1/7A Thrust aircraft, a fuel planning graph for the same airplane, comparative power charts and computer run offs to help substantiate the information are included. E.A.K.

**N83-17464#** Eastern Air Lines, Inc., Atlanta, Ga. Air Traffic Systems Dept.
**AIR TRAFFIC CONTROL: ITS EFFECT ON FUEL CONSERVATION** c04
Edwin H. Price *In* DOE Symp. on Com. Aviation Energy Conserv. Strategies Apr. 1981 p 147-162 (For primary document see N83-17455 08-01)
Avail: NTIS HC A17/MF A01 CSCL 01/2

Air traffic delays and its cost in waste fuel were examined. It is suggested that the most productive way to reduce this huge waste of fuel is to develop a more efficient ATC system, one that minimizes delays and still provides for reasonable growth in air traffic. Ways to resolve air traffic increase are suggested to increase capacity and reduce delays. A number of programs to help the users save fuel are implemented: (1) local flow traffic management; (2) pilot discretion descents; (3) more frequent approval of direct routes; (4) more frequent approval of requested altitudes; and (5) unrestricted climb to altitude. These procedures allow aircraft to remain higher, longer, at the more fuel efficient altitudes. E.A.K.

**N83-17465#** United Air Lines, Inc., Denver, Colo. Maintenance Operations Div.
**COMPUTERIZED ENGINE AND AIRPLANE PERFORMANCE MONITORING PROGRAMS**
M. B. Schwartz and A. E. Domke *In* DOE Symp. on Com. Aviation Energy Conserv. Strategies Apr. 1981 p 171-208 (For primary document see N83-17455 08-01)
Avail: NTIS HC A17/MF A01 CSCL 01/2

Computerized engine and airplane monitoring programs, an important element among the many fuel conservation activities were examined. These systems provide ongoing information on the condition of each individual airplane and the health of the installed engines. Any airplane or engine performance deterioration is apparent and further investigation can be implemented and the necessary action taken. Efforts to audit the effects of performance altering factors are discussed. The Cruise Data Survey System used to measure drag differences between reverser configurations on the 727 airplanes is presented. Long term performance deterioration and the economic unfeasibility of restoring engines and airplanes to new condition are discussed. E.A.K.

**N83-17466#** Lufthansa German Airlines, Cologne (West Germany).
**SLIDESLIP INDICATION SYSTEM** c06
Dieter Horst *In* DOE Symp. on Com. Aviation Energy Conserv. Strategies Apr. 1981 p 209-230 Previously announced as N82-25181 (For primary document see N83-17455 08-01)
Avail: NTIS HC A17/MF A01 CSCL 01/2

The development of a sideslip indication system for aircraft fuel conservation is outlined. A stall warning vane type sensor and an indicator in the cockpit were employed to detect horizontal gust activity. The teledyne stall warning transmitter can be used as a sideslip sensor. The following parameters are computated: sideslip angle, indicated air speed, magnetic heading, altitude, rudder position, elevator position, roll angle, and slat position. E.A.K.

**N83-17467#** Flow Application Research, Fremont, Calif.
**TURBINE ENGINE FUEL CONSERVATION BY FAN AND COMPRESSOR PROFILE CONTROL** c07
William B. Roberts and William Rogers (Rogers-Dierks, Inc.) *In* DOE Symp. on Com. Aviation Energy Conserv. Strategies Apr. 1981 p 231-258 (For primary document see N83-17455 08-01)
Avail: NTIS HC A17/MF A01 CSCL 01/2

The control of the compressor blade shapes which can provide fuel savings was examined. The blade shapes become distorted due to erosion which causes an aerodynamic performance deterioration and increases fuel consumption. Refurbished and new blades are at fuel consumption to near new engine values. Reconditioned blades which are sorted, reshaped and matched allow a superior recovery of fuel efficiency without the need for new blades. New blades, upon being put into service, can greatly benefit from being sorted, reshaped, and matched to allow full performance potential to be realized. The first stage fan blade is most critical, since it operates in a high erosion environment at supercritical aerodynamic conditions, while consuming more power than any other single blade. It is shown that fan and compressor blade shape control can lower fuel burn as much as 2-2 1/2% compared to standard refurbishment which leads to a significant fuel savings if implemented on a fleet wide basis. It is suggested that all aviation gas turbine engines would benefit from fan and compressor blade profile control. E.A.K.

**N83-17468#** Eastern Air Lines, Inc., Atlanta, Ga.
**A PRACTICAL ECONOMIC CRITERION FOR FUEL CONSERVATION** c83
D. Roger Ferguson *In* DOE Symp. on Com. Aviation Energy Conserv. Strategies Apr. 1981 p 259-280 (For primary document see N83-17455 08-01)
Avail: NTIS HC A17/MF A01 CSCL 01/2

A method to determine the value of time to input into the least cost method of computer flight planning that will optimize the fuel time tradeoffs available over the planning time horizon is proposed. Fuel can be saved by flying the aircraft at slower speeds, however, there is an economic penalty in pursuing this policy to its ultimate limit. No policy decision can possibly encompass all the variables of temperature, wind, wind gradients and payload encountered by the thousands of flights operations. The computer flight plan systems to optimize each flight for the variables of wind, wind gradient, temperature and payload, but can not resolve the value of time to use that allows the computer to optimize each flight consistently and correctly. E.A.K.

**N83-17469#** United Air Lines, Inc., Denver, Colo.
**PILOT/AIRCRAFT FUEL PERFORMANCE EVALUATION** c54
Gordon A. McKinzie *In* DOE Symp. on Com. Aviation Energy Conserv. Strategies Apr. 1981 p 281-306 (For primary document see N83-17455 08-01)
Avail: NTIS HC A17/MF A01 CSCL 01/2

Methods in four areas which determine: (1) the extent of fuel consumption; (2) the manner in which this information is used to forecast fuel usage; (3) present measuring systems; and (4) goals and the ways they can be developed and tracked, are discussed. The four methods for fuel measurement information cover four areas: pilots, flight management, top management, and outside agencies. The development of accountability systems for how and where all fuel is consumed is recommended. E.A.K.

**N83-17470#** Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
**PREDICTION OF AERODYNAMIC LOADS ON ROTORCRAFT**
Sep. 1982 305 p refs In ENGLISH and FRENCH Meeting held

in London, 17-18 May 1982
(AGARD-CP-334; ISBN-92-835-0320-1) Avail: NTIS HC A14/MF A01

Advances in rotor airloads prediction methods, including the evolution to the present state of the art, the capabilities and limitations of the current methodology, and the specific areas that need further effort are discussed. Primary emphasis is on the prediction and experimental verification of the steady and unsteady aerodynamic forces on the rotor blades of modern helicopters and related devices, such as wind turbines. For individual titles, see N83-17471 through N83-17489.

**N83-17471#** Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France). Aerodynamics Dept.
**THE ROLE OF ANALYSIS IN THE AERODYNAMIC DESIGN OF ADVANCED ROTORS** **c02**
L. Dadone *In* AGARD Prediction of Aerodyn. Loads on Rotorcraft Sep. 1982 12 p refs (For primary document see N83-17470 08-01)
Avail: NTIS HC A14/MF A01

The extent to which flow analysis influences rotor design is reviewed from a manufacturer's point of view. An interim method is suggested for defining tip geometries for high speed flight until rotor blades can be modeled more rigorously. The potential value of new computational methods in improving the aerodynamic efficiency of helicopter rotors is addressed. A.R.H.

**N83-17472#** Westland Aircraft Ltd., Hayes (England).
**REPRESENTATION OF AIRFOIL BEHAVIOUR** **c02**
T. S. Beddoes *In* AGARD Prediction of Aerodyn. Loads on Rotorcraft Sep. 1982 11 p refs (For primary document see N83-17470 08-01)
Avail: NTIS HC A14/MF A01

A time delay model for dynamic stall, generated several years ago, is discussed with regard to current applications in rotor analysis programs. The shortcomings of the model are highlighted to illustrate the objectives for an improved approach. A formulation is presented for a second generation model for unsteady airfoil behavior. This involves the identification and representation of, trailing edge and leading edge or shock induced separation together with vortex shedding, where appropriate, all within the constraints imposed by computational requirements. The overall model is structured around the solution for time dependant fully attached flow. For a sampled solution which follows from the azimuth stepping procedure of the rotor calculation, the most appropriate form is the indicial response function for which standard solutions are available. A.R.H.

**N83-17473#** Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
**STUDIES OF AEROFOILS AND BLADE TIPS FOR HELICOPTERS** **c02**
J. J. Thibert and J. J. Philippe *In* AGARD Prediction of Aerodyn. Loads on Rotorcraft Sep. 1982 14 p refs In FRENCH; ENGLISH summary (For primary document see N83-17470 08-01)
Avail: NTIS HC A14/MF A01

The design methodology of a family of airfoils is presented and the performances of these airfoils deduced from wind tunnel tests are compared with those of other known airfoils and with the theoretical predictions. Theoretical and experimental studies of the flow around several blade tips are presented. Emphasis is put on the design of new blade tips in order to improve the advancing blade behavior and so the total rotor performances. A.R.H.

**N83-17474#** Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany).
**CALCULATION OF 3D UNSTEADY TRANSONIC FLOW AROUND ROTOR BLADES** **c02**
H. Stahl *In* AGARD Prediction of Aerodyn. Loads on Rotorcraft Sep. 1982 13 p refs (For primary document see N83-17470 08-01)
Avail: NTIS HC A14/MF A01

By applying and adapting classical wing methods to the special requirements of rotor blade tip flow the limitations of the current methods, such as large computational times can be overcome. The unsteady calculation is carried out by a finite difference method for the 2-D case considering both the angle of attack and the Mach number variation. The 3-D calculation is based on a finite element model for fixed wings, which is adapted for the rotor blade application by a linearly varying velocity distribution over the blade radius. Only the outer 25% of the radius is considered. The final lift and moment distributions on the blade are determined by superposition of 3-D steady and 2-D unsteady results. By adapting these semi-empirical results in rotor models, their applicability can be improved especially for the advancing blade, as well as over the whole azimuth angle region. A.R.H.

**N83-17475#** Technische Hogeschool, Delft (Netherlands). Dept. of Aerospace Engineering.
**AERODYNAMIC RESEARCH ON TIPVANE WINDTURBINES** **c44**
G. J. W. vanBussel, Th. vanHolten, and G. A. M. vanKuik *In* AGARD Prediction of Aerodyn. Loads on Rotorcraft Sep. 1982 13 p refs (For primary document see N83-17470 08-01)
Avail: NTIS HC A14/MF A01

Tipvanes are small auxiliary wings mounted at the tips of windturbine blades in such a way that a diffuser effect is generated, resulting in a mass flow augmentation through the turbine disc. For predicting aerodynamic loads on the tipvane wind turbine, the acceleration potential is used and an expansion method is applied. In its simplest form, this method can essentially be classified as a lifting line approach, however, with a proper choice of the basis load distributions of the lifting line, the numerical integration of the pressurefield becomes one dimensional. the integration of the other variable can be performed analytically. The complete analytical expression for the pressure field consists of two series of basic pressure fields. One series is related to the basic load distributions over the turbineblade, and the other series to the basic load distribution over the tipvane. A.R.H.

**N83-17476#** Aeritalia S.p.A., Torino (Italy). Energy Sector.
**AERODYNAMIC LOAD CALCULATION OF HORIZONTAL AXIS WIND TURBINE IN NON-UNIFORM FLOW** **c44**
Elio Lupo *In* AGARD Prediction of Aerodyn. Loads on Rotorcraft Sep. 1982 10 p refs (For primary document see N83-17470 08-01)
Avail: NTIS HC A14/MF A01

An aerodynamic computer program, applicable to upwind rotors, was developed to calculate variable loads on rotor blades due to nonuniform flow. This program takes into account the atmospheric boundary layer, the variation in wind direction, and tower reflection. The aerodynamic analysis is based on a combination of momentum and blade element equations. The aerodynamic conditions and the airloads are for 36 azimuth positions of a rigid blade during its rotation. The inputs of the program are the geometric characteristics of the rotor and blades, the aerodynamic characteristic of the airfoil sections, the wind shear expression, the yaw and tilt angle with wind direction and the rotor-tower diameter ratio for cylindrical towers. A.R.H.

**N83-17477#** Institut de Mecanique des Fluides de Toulouse (France). Inst. de Mecanique.
**PREDICTION AND EXPERIMENTAL VERIFICATION OF THE VELOCITY FIELDS OF A ROTOR DURING HOVERING [PREDICTION ET VERIFICATION EXPERIMENTALE DU CHAMP DES VITESSES D'UN ROTOR EN VOL STATIONNAIRE]** **c02**
C. Maresca, M. Nsi Mba, and D. Favier *In* AGARD Prediction of Aerodyn. Loads on Rotorcraft Sep. 1982 18 p refs In FRENCH (For primary document see N83-17470 08-01)
Avail: NTIS HC A14/MF A01

The hypotheses and confidence limits of a computer program relating to the performance of a helicopter rotor during hovering are tested. This computation, which is based on the principle of putting into partial equilibrium an initially prescribed wake using empirical laws, permits the instantaneous determination of the

velocity fields and associated performances. Three components of the velocity vector were measured with the aid of crossed hot-wire and laser anemometers. The swirling lines of the tip were determined by visualization and crossed hot-wire anemometer. Total forces (traction and coupled) were likewise measured. The comparison of computation with experiment involved large scale variations of parameters: number of blades, general passage, twisting action (linear and nonlinear), and tip geometry. Results show satisfactory calculation for certain configurations. For other configurations, results remain to be seen. The consideration of a better modeled far wake and of a evolving structure of a turbulent hub prove indispensable in the computation model.

Transl. by A.R.H.

**N83-17478#** Bell Helicopter Co., Fort Worth, Tex. Aerodynamics Technology Dept.

**VELOCITY COUPLING. A NEW CONCEPT FOR HOVER AND AXIAL FLOW WAKE ANALYSIS AND DESIGN** **c02**

J. David Kocurek and Lenard F. Berkowitz *In* AGARD Prediction of Aerodyn. Loads on Rotorcraft Sep. 1982 13 p refs (For primary document see N83-17470 08-01)

Avail: NTIS HC A14/MF A01

The history and development of the distorted prescribed wake method is reviewed as introduction to velocity coupling, a approach which defines the key parameters of the wake in hover and axial translation. This technique is formulated from the concept of principal wake induced velocities which are calculated iteratively as simple functions of loading and key geometric characteristics of the near wake tip vortex spirals. This velocity coupled wake model predicts the hovering rotor's wake geometry in greater detail as compared to earlier methods. Also, correlation with a rotor in axial climb demonstrates the successful application of the method to this regime. These examples illustrate how the velocity formulation isolates the major interactions of the wake elements, by not only clarifying experimentally observed characteristics, but also providing a physical basis for systematic refinement of the prescribed wake method. A.R.H.

**N83-17479#** Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany).

**STUDIES ON BLADE-TO-BLADE AND ROTOR-FUSELAGE-TAIL INTERFERENCES** **c02**

H. Huber and G. Polz *In* AGARD Prediction of Aerodyn. Loads on Rotorcraft Sep. 1982 16 p refs (For primary document see N83-17470 08-01)

Avail: NTIS HC A14/MF A01

Analytical modeling techniques, including prescribed-contracted-wake analysis, and free-wake-models are described for the blade-blade vortex interaction phenomenon, where the unsteady pressure fluctuations, due to the vortices impact, result in highly impulsive blade loadings, excessive dynamic hub forces/moments, and impulsive noise signatures. Experimental results obtained from in-flight blade modal bending measurements are presented. The interactional aerodynamic flow from the fuselage to the rotor blades is treated. A singularity model is used for the flow calculation around the fuselage body. Parametric influences of the rotor-fuselage separation distance are shown. Interference flow effects between the rotor head and fuselage to the tail area are investigated. For the analytical representation of the steady interference flow a model, containing separated flow calculation, is used. Steady pressure contours and dynamic pressure and flow angle fluctuations at the empennage/tail rotor area are shown including WT-model and full-scale flight test results. A.R.H.

**N83-17480#** Pisa Univ. (Italy). Istituto di Macchine.

**ROTOR-FUSELAGE INTERFERENCE ON ENGINE INTERNAL AERODYNAMICS IN MANEUVERING HIGH-SPEED ROTORCRAFT** **c02**

Dino Dini *In* AGARD Prediction of Aerodyn. Loads on Rotorcraft Sep. 1982 14 p refs (For primary document see N83-17470 08-01)

Avail: NTIS HC A14/MF A01

Because of the rotor-fuselage integration, aeroelastic instabilities must be predicted for a reliable engine control design. Fatigue limits imposed on helicopter engines are more severe than in other automotive application, because of the vibration level induced in the engine core. Periodic aerodynamic and inertial blade loadings may have serious consequences with respect to the shafts and the discs to which these blades are attached. Flutter, with either random or uniform phasing between adjacent blades, may exert oscillatory root reactions that integrate for the entire disc and excite a shaft resonance. Unsteady loads resulting from rotor blades vortex interactions and aerodynamic interference effects with the fuselage in high flight speed rotorcraft are considered from the point of view of the influence on engine internal aerodynamics.

Author

**N83-17481#** Royal Aircraft Establishment, Farnborough (England). Structures Dept.

**DEVELOPMENT OF THE VORTEX RING WAKE MODEL AND ITS INFLUENCE ON THE PREDICTION OF ROTOR LOADS** **c02**

C. Young *In* AGARD Prediction of Aerodyn. Loads on Rotorcraft Sep. 1982 13 p refs (For primary document see N83-17470 08-01)

Avail: NTIS HC A14/MF A01

The wake trailed by helicopter rotor blades which is important in the determination of loads and vibrational forces transmitted to the fuselage was examined. The vortex ring wake model is widely used in the prediction of helicopter rotor loads. The evolution of the model is traced from the original form developed over 10 years ago to the current version which includes the distortion due to the aircraft fuselage and an interactive near wake. The effects of improvements in the model are illustrated at each stage with comparisons between flight test data obtained with the Puma helicopter. The predicted and measured hub forces and moments for the Lynx helicoper are compared. E.A.K.

**N83-17482#** Office National d'Etudes et de Recherches Aerospatiales, Paris (France).

**AEROELASTIC EQUILIBRIUM OF AN HELICOPTER ROTOR WITH NONLINEAR AERODYNAMIC FORCES** **c61**

Jean-Joel Costes *In* AGARD Prediction of Aerodyn. Loads on Rotorcraft Sep. 1982 21 p refs In FRENCH; ENGLISH summary (For primary document see N83-17470 08-01)

Avail: NTIS HC A14/MF A01

A computer code which includes aeroelastic couplings for stalled flight cases is presented. The modification of the classical linear aerodynamics to include stall is examined. The nonlinear forces are given by mathematical models and a single nonlinear system of equations, written in a form suitable for a step by step resolution is obtained. Examples and a few comparisons between theory and experiment are given. E.A.K.

**N83-17483#** Costruzioni Aeronautiche Giovanni Agusta S.p.A., Varese (Italy). Dynamics Engineering Dept.

**FIRST RESULTS FOR THE DEFINITION OF A GENERAL ROTORCRAFT DYNAMIC PROGRAM** **c61**

Anselmo Russo and Alberto Ceriotti *In* AGARD Prediction of Aerodyn. Loads on Rotorcraft Sep. 1982 14 p refs (For primary document see N83-17470 08-01)

Avail: NTIS HC A14/MF A01

A computer program able to solve the large number of problems related to the dynamic behavior of a rotor or a complete helicopter is described. The analytical model is described by a technique similar to the finite element analysis, the equations of motion are obtained by general equation of dynamics, in its standard matrix form. The operations are the linearization, around the actual position of dynamic equilibrium, of the equations of motion and constraint equations. Forcing functions can be either forces or imposed displacements depending on time as well as on any kinematic value of other elements or their own kinematic value. The steady aerodynamic coefficients are computed from the local incidence deduced by means of kinematic, gust, and induced velocities of the rotor wakes introduced into the model. Particular attention is

paid to the input data both for a rational description of the model and not to cause format troubles to the user. E.A.K.

**N83-17484#** Sikorsky Aircraft, Stratford, Conn. Aeromechanics Dept.
**REVIEW OF ROTOR LOADS PREDICTION METHODS** c02
Peter J. Arcidiacono and Robert Sopher *In* AGARD Prediction of Aerodyn. Loads on Rotorcraft Sep. 1982 18 p refs (For primary document see N83-17470 08-01)
Avail: NTIS HC A14/MF A01

Recent progress made in predicting rotor loads is reviewed. The development of improved loads analysis is reviewed. Technical areas recommended for priority attention in the future and the perception of technology opportunities are identified. The aerodynamic aspects of rotor loads analyses generally have not changed greatly since 1974. Progress was made in addressing the fundamental aerodynamic areas, this progress is not always integrated into the load programs. The structural aspects of the loads programs have advanced, particularly with respect to consistent formulation of equations and the ability to efficiently assemble the desired dynamic elements for problems of varying degrees of complexity. E.A.K.

**N83-17485#** Army Research and Technology Labs., Moffett Field, Calif.
**THE DEVELOPMENT OF A SYSTEM FOR INTERDISCIPLINARY ANALYSIS OF ROTORCRAFT FLIGHT CHARACTERISTICS** c61
Andrew W. Kerr and Wendell B. Stephens (Army Aeromechanics Labs.) *In* AGARD Prediction of Aerodyn. Loads on Rotorcraft Sep. 1982 14 p refs (For primary document see N83-17470 08-01)
Avail: NTIS HC A14/MF A01

A comprehensive, interdisciplinary analysis system was developed to predict the technical characteristics of a wide variety of rotary wing configurations. The approach used in the development of the system is reviewed and the software methodology used to support the development is described. The mathematical basis for the system and the top level analysis and architectural design of the system are presented. The potential ability of the system to predict rotor loads is discussed. E.A.K.

**N83-17486#** Societe Nationale Industrielle Aerospatiale, Marseille (France).
**METHODS USED AT AEROSPATIALE FOR CALCULATING THE LOADS ON A ROTOR AND EXPERIMENTAL CROSS CHECKS [METHODES DE CALCUL DES CHARGES SUR ROTOR UTILISEES A L'AEROSPATIALE ET RECOUPEMENTS EXPERIMENTAUX]** c02
B. Masure and Vuillet *In* AGARD Prediction of Aerodyn. Loads on Rotorcraft Sep. 1982 13 p refs In FRENCH (For primary document see N83-17470 08-01)
Avail: NTIS HC A14/MF A01

The modal method, the method of azimuths, and a simplified method for calculating static loads are presented. The simplifying hypotheses held, common to all three methods, are reviewed as well as the condensed form of the basic equations established. The principal characteristics of the methods are described. The quality of these prediction methods is then analyzed using cross checks with flight tests on the prototype Gazelle 3492 and on the Super Puma AS332. For the former, the comparison concerns only dynamic forces; for the latter, dynamic and static forces. The only flights considered are stabilized flights with or without the load factor. Agreement is generally satisfactory but certain anomalies sometimes appear for static loads at the base of the blade as well as for torsion moments. For the latter case, the poor quality of the cross checks should be attributable to the fact that unsteady aerodynamic phenomena, not modeled in the present numerical application, play a role that cannot be neglected.
Transl. by A.R.H.

**N83-17487#** Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Inst. fuer Flugmechanik.
**COMPARISON OF ROTOR ANALYSIS RESULTS WITH AERODYNAMIC WINDTUNNEL DATA** c02
H.-J. Langer, W. V. Gruenhagen, and B. Junker *In* AGARD Prediction of Aerodyn. Loads on Rotorcraft Sep. 1982 13 p refs (For primary document see N83-17470 08-01)
Avail: NTIS HC A14/MF A01

Measurements for hub moments and blade stresses are presented. Downwash velocities are recorded under the retreating and advancing side of the rotor. The windtunnel measuring data are compared with calculations and computer programs were built up to calculate downwash as well as rotor and blade forces and moments. Different procedures are compared with windtunnel measurements. The results of the calculation of the hub loads, blade loads, and downwash vary considerably, so that the accuracy of the different calculation methods can be checked. E.A.K.

**N83-17488#** Royal Aircraft Establishment, Bedford (England). Flight Systems Dept.
**AN APPRAISAL OF ROTOR BLADE-TIP VORTEX INTERACTION AND WAKE GEOMETRY FROM FLIGHT MEASUREMENTS** c02
P. Brotherhood *In* AGARD Prediction of Aerodyn. Loads on Rotorcraft Sep. 1982 14 p refs (For primary document see N83-17470 08-01)
Avail: NTIS HC A14/MF A01

The close radial spacing of leading edge pressure transducers used as incidence and loading indicators on a Puma helicopter blade produces a global picture of the effects of blade tip vortex interaction. Features of the wake geometry are compared with prediction and the loading action of the tip vortex on the following blade is assessed. E.A.K.

**N83-17489#** Army Research and Technology Labs., Fort Eustis, Va. Applied Technology Lab.
**DATAMAP AND ITS IMPACT ON PREDICTION PROGRAMS** c61
Donald J. Merkley and Arthur E. Ragosta *In* AGARD Prediction of Aerodyn. Loads on Rotorcraft Sep. 1982 13 p refs (For primary document see N83-17470 08-01)
Avail: NTIS HC A14/MF A01

The DATAMAP (data from aeromechanics' test and analytics--management and analysis package), a computer software system that provides direct access to large time history data bases, performs analyses and derivations, and displays the data in various formats, interactively or through batch processing is described. The ability of directly comparing analytical, model and full scale test results is emphasized; the care which must be taken when utilizing DATAMAP; and its effect on the plans for the second generation comprehensive helicopter analysis system is emphasized (2GCHAS). The operational loads survey (OLS) data base is described and the development of DATAMAP is discussed. The DATAMAP's versatility is shown and its ability to access any time history data base and its modular concept whereby any appropriate analysis or derivation can be added to the existing capabilities as the need arises are emphasized. Plots which show various formats that are available to the user are presented. E.A.K.

**N83-17490#** Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
**HUMAN FACTORS ASPECTS OF AIRCRAFT ACCIDENTS**
Oct. 1982 141 p refs In ENGLISH and FRENCH Lectures held in Lisbon, 4-5 Nov. 1982, in Ankara, 8-9 Nov. 1982 and in Athens, 11-12 Nov. 1982
(AGARD-LS-125; ISBN-92-835-0319-7) Avail: NTIS HC A07/MF A01

Human factors engineering and aircraft accidents are discussed. For individual titles, see N83-17491 through N83-17500.

**N83-17491#** School of Aerospace Medicine, Brooks AFB, Tex.
**AN OVERVIEW OF HUMAN FACTORS IN AIRCRAFT ACCIDENTS AND INVESTIGATIVE TECHNIQUES** c03
B. O. Hartman *In* AGARD Human Factors Aspects of Aircraft

Accidents Oct. 1982 4 p refs (For primary document see N83-17490 08-01)
Avail: NTIS HC A07/MF A01

Human factors in aircraft accidents and investigative techniques are reviewed. N.W.

**N83-17492#** Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
**HUMAN FACTORS IN AIRCRAFT ACCIDENTS: PRESENT STATUS AND SIGNIFICANT CONCERNS [ASPECTS DES FACTEURS HUMAINS DANS LES ACCIDENTS D'AVIATION: STATUT ACTUEL ET SOUCIS SIGNIFICATIFS]** **c03**
M. Vigier *In its* Human Factors Aspects of Aircraft Accidents Oct. 1982 20 p In FRENCH (For primary document see N83-17490 08-01)
Avail: NTIS HC A07/MF A01

Inquiry is frequently led to consider the human factor in the classical chain of elements which produce an aircraft accident. When assembling the particular characteristics which are more or less favorable to aviation safety in the European context, it is interesting to examine some statistical aspects and to attempt to evaluate the importance of this factor by relating it to the group of causal factors held. This percentage shows little variation in the course of years and remains the same no matter what category of aeronautical activity is involved. The human factor very probably exceeds the 60% rate. It is not easy to correctly apprise this factor which covers an immense field. Certain principles of research are outlined for two indicators: ground personnel and flying personnel. Nevertheless, if the inquirer can generally evidence the implications of human error in the unfolding of the accident, the deep seated reasons often escape and merit the attentions of specialists. A.R.H.

**N83-17493*#** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
**THE INFLUENCE OF HANDLING QUALITIES, CRASHWORTHINESS AND OTHER ENGINEERING FACTORS ON AIRCRAFT SAFETY** **c03**
Seth B. Anderson *In* AGARD Human Factors Aspects of Aircraft Accidents Oct. 1982 11 p refs (For primary document see N83-17490 08-01)
Avail: NTIS HC A07/MF A01 CSCL 01C

The relationship of handling qualities to safety, crashworthiness, and survivability are examined. Author

**N83-17494#** Canadian Forces Air Command, Winnipeg (Manitoba).
**A BRIEF REVIEW OF SELECTED AREAS OF AVIATION MEDICINE AND PHYSIOLOGY** **c52**
W. C. Hartzell *In* AGARD Human Factors Aspects of Aircraft Accidents Oct. 1982 21 p refs (For primary document see N83-17490 08-01)
Avail: NTIS HC A07/MF A01

Aviation medicine and physiology are reviewed with specific focus on those aspects which relate to safety and accidents. Specific emphasis is given to the aeromedical aspects of the effects of altitude, the acceleration environment, disorientation stresses and visual function and problems in flight, as these areas are felt to have most significant potential impact on flight safety. The presentation is concluded with a brief discussion of the common acute causes for grounding and sudden incapacitation which are of concern in military aviation. Author

**N83-17495#** Air Force Inst. of Aviation Medicine, Fuerstenfeldbruck (West Germany).
**HUMAN FACTORS** **c54**
Gerd O. Spohd *In* AGARD Human Factors Aspects of Aircraft Accidents Oct. 1982 18 p refs (For primary document see N83-17490 08-01)
Avail: NTIS HC A07/MF A01

The complex relations of factors causing man to fail in military aviation are reduced to a simple model. Basic connections between the several components of a controller, computer and decision maker are drawn and applied step by step to the aviator's conditions. Man's abilities and qualifications for the perception of cues are discussed, their importance in the field of aviation indicated. The importance of human engineering, display and control design including information presentation is related to aviation; basic principles for the development of future design are listed. Physiological factors and their importance on pilots' performance capabilities as well as psychological factors like alterations in attention, arousal and motivation, and the aviator's need for decision making are discussed. Problems of aircrew selection, crew monitoring, crew training and performance supervision, in combination with suggestions for improvement, and an accident zone model, based on a recent study within the GAF, are included. Author

**N83-17496#** Edinburgh Univ. (Scotland). Dept. of Forensic Medicine.
**PATHOLOGY ASPECTS OF THE HUMAN FACTORS INVESTIGATION** **c52**
J. K. Mason *In* AGARD Human Factors Aspects of Aircraft Accidents Oct. 1982 5 p refs (For primary document see N83-17490 08-01)
Avail: NTIS HC A07/MF A01

The principles of aviation pathology are outlined, with particular emphasis on utilizing autopsy examination in search of the twin objectives of establishing the cause of the accident or assessing the reason for fatalities occurring. The prevention of fatal accidents is illustrated by the use of pathology in the development of the ejection seat and by a study of light aircraft accidents resulting in fatal head injuries. In accidents involving large aircraft, the importance of establishing a pattern of injuries so as to indicate the type of the accident is enlarged upon. Pathology is regarded as an essential part of the investigation of an aircraft accident but, like any other discipline, it only functions at its best in the context of a 'group system'. Author

**N83-17497*#** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
**THE ENGINEERING INVESTIGATION OF AIRCRAFT ACCIDENTS** **c03**
Seth B. Anderson *In* AGARD Human Factors Aspects of Aircraft Accidents Oct. 1982 8 p refs (For primary document see N83-17490 08-01)
Avail: NTIS HC A07/MF A01 CSCL 01C

The organization and plan for an investigation, procedures used at the scene of the accident, engineering aspects covered in the main investigation, use of special analytical techniques and simulation tools, and use of flight recorder data are discussed. Examples of investigations are used to illustrate the processes used. Author

**N83-17498#** Royal Air Force Inst. of Aviation Medicine, Farnborough (England).
**LIFE SUPPORT, RESTRAINT AND EJECTION SYSTEMS INVESTIGATION** **c54**
D. J. Anton *In* AGARD Human Factors Aspects of Aircraft Accidents Oct. 1982 7 p refs (For primary document see N83-17490 08-01)
Avail: NTIS HC A07/MF A01

The examination of life support, restraint and ejection systems is an integral part of the investigation of any aircraft accident. It is important that it should be conducted in a thorough manner and particular care should be taken in the field phase of the investigation as much of that evidence is, by its nature, ephemeral. Author

**N83-17499#** Air Force Hospital, England AFB, La.
**AIRCRAFT ACCIDENT INVESTIGATION AND THE FLIGHT SURGEON** **c52**
Russell B. Rayman *In* AGARD Human Factors Aspects of Aircraft Accidents Oct. 1982 8 p refs (For primary document see N83-17490 08-01)
Avail: NTIS HC A07/MF A01

The essentials of aircraft accident investigation are described. The flight surgeon's role is to determine the cause of injury/death,

to decide if egress/life support equipment functioned properly during the escape, survival, and rescue sequence, and to ascertain if there were medical or human factors which contributed to the accident. How the flight surgeon fulfills this role is discussed.
Author

**N83-17500#** Edinburgh Univ. (Scotland). Dept. of Forensic Medicine.
**MEDICO LEGAL ASPECTS OF THE PATHOLOGICAL INVESTIGATION** c52
J. K. Mason *In* AGARD Human Factors Aspects of Aircraft Accidents Oct. 1982 5 p refs (For primary document see N83-17490 08-01)
Avail: NTIS HC A07/MF A01

The medico legal aspects of aircraft accidents are described from the viewpoint of a major international airline disaster as it is in such a situation that the problems are maximized. The importance of identification of cadavers both in the legal field and in accident investigation is stressed. Insurance problems in passengers are discussed and mention made of the very specific problem of aviation simultaneous death. The investigation for criminal activity is outlined, particular emphasis being placed on radiology. In view of the importance to individual families of many of these questions, a plea is made for standardization of techniques throughout the world.
Author

# 02 AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer.*

**N83-17501*#** Illinois Inst. of Tech., Chicago. Fluids Group.
**ON THE DESIGN OF CONTRACTIONS AND SETTLING CHAMBERS FOR OPTIMAL TURBULENCE MANIPULATION IN WIND TUNNELS Final Technical Report**
Alain Marion, Jimmy Tan-atichat, and Hassan M. Nagib Jan. 1983 124 p refs
(Grant NAG1-74)
(NASA-CR-169847; NAS 1.26:169847; IIT-FHT-R83-2) Avail: NTIS HC A06/MF A01 CSCL 01A

The sensitivity of a moderate axisymmetric contraction of turbulence to upstream conditions is parametrically investigated in terms of turbulence intensities and integral length scales. The streamwise development of the basic turbulence characteristics is first documented for a straight duct in order to determine the inlet conditions that would produce the required exit intensities and integral length scales in the test section downstream of the contraction. These results and some analysis based on dimensional and spectral arguments lead to relations that correlate the behavior of the intensity and scale of homogeneous turbulence during its early period of decay downstream of turbulence manipulators. Finally this study shows that the efficiency of a contraction as a turbulence reducer is not affected by the initial intensity of the turbulence when the results are corrected for viscous dissipation.
Author

**N83-17502*#** Illinois Inst. of Tech., Chicago.
**INTERPRETATION OF 2-PROBE TURBULENCE MEASUREMENTS IN AN AXISYMMETRIC CONTRACTION Final Report**
Catherine Marion-Moulin, Jimmy Tan-atichat, and Hassan M. Nagib Jan. 1983 74 p refs
(Grant NsG-3220)
(NASA-CR-169832; NAS 1.26:169832; IITFHT-R83-1) Avail: NTIS HC A04/MF A01 CSCL 01A

Simultaneous measurements of the streamwise and radial velocity components at two points, one on and one off the centerline with variable radial separation, were digitally recorded and processed at several stations along a four to one contraction with controlled upstream turbulence conditions. Various statistical quantities are presented including spectra and coherence functions. The integral L sub ux, L sub um, L sub vx, L sub vm were also estimated and their variation along the contraction is examined.
Author

**N83-17503*#** Illinois Inst. of Tech., Chicago.
**EXPERIMENTS ON IDENTIFICATION AND CONTROL OF INFLOW DISTURBANCES IN CONTRACTING STREAMS Final Report**
Amy H. Lee, Hassan M. Nagib, Jimmy Tan-atichat, and Dieter M. Wittwer Dec. 1982 169 p refs
(Grant NsG-3220)
(NASA-CR-169831; NAS 1.26:169831; IIT-FHT-R82-3) Avail: NTIS HC A08/MF A01 CSCL 01A

Vorticity from all surfaces and isolated objects in the vicinity of the fan intake, including the outside surfaces of the fan housing, were identified as the major sources for disturbances leading to blade passing frequency noise. The previously proposed mechanism based on atmospheric turbulence is refuted. Flow visualization and hot wire techniques were used in three different facilities to document the evolution of various types of disturbances, including the details of the mean flow and turbulence characteristics. The results suggest that special attention must be devoted to the design of the inlet and that geometric modeling may not lead to adequate simulation of the in flight characteristics. While honeycomb type flow manipulators appear to be effective in reducing some of the disturbances, higher pressure drop devices that generate adequate turbulence, for mixing of isolated nonuniformities, may be necessary to suppress the remaining disturbances. The results are also applicable to the design of inlets of open return wind tunnels and similar flow facilities.
Author

**N83-17504#** National Aerospace Lab., Tokyo (Japan).
**CALCULATION OF UNSTEADY TRANSONIC POTENTIAL FLOW OVER OSCILLATING THREE-DIMENSIONAL WINGS**
Koji Isogai Mar. 1982 26 p refs Presented at the Ann. Meeting of the Japan Soc. for Aeron. and Space Sci., Tokyo, 6-7 Apr. 1981
(NAL-TR-706T; ISSN-0389-4010) Avail: NTIS HC A03/MF A01

A numerical method for solving the unsteady transonic three dimensional full potential equation is presented. The finite difference scheme employed in the method is a time marching semi-implicit and implicit two sweep procedure. To capture the shock wave, a quasi-conservative scheme is employed. To validate the present method, many numerical examples including the results of unsteady pressure distributions on an oscillating horizontal tail model, for which reliable experimental data exist, are presented.
Author

**N83-17505*#** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
**AN EXPERIMENTAL STUDY OF DYNAMIC STALL ON ADVANCED AIRFOIL SECTIONS. VOLUME 3: HOT-WIRE AND HOT FILM MEASUREMENTS**
L. W. Carr, W. J. McCroskey, K. W. McAlister, S. L. Pucci, and O. Lambert (Service Technique des Constructions Aeronautiques, Paris) Dec. 1982 69 p refs Sponsored in part by AVRADCOM
(NASA-TM-84245; A-8938; NAS 1.15:84245;
USAAVRADCOM-TR-82-A-8) Avail: NTIS HC A04/MF A01 CSCL 01A

Detailed unsteady boundary layer measurements are presented for eight airfoils oscillated in pitch through the dynamic stall regime. The present report (the third of three volumes) describes the techniques developed for analysis and evaluation of the hot film and hot wire signals, offers some interpretation of the results, and tabulates all the cases in which flow reversal has been recorded.
Author

**N83-17506*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
**SUPERSONIC AERODYNAMIC CHARACTERISTICS OF A TAIL-CONTROL CRUCIFORM MANEUVERABLE MISSILE WITH AND WITHOUT WINGS**

M. Leroy Spearman Jan. 1983 13 p refs
(NASA-TM-84600; NAS 1.15:84600) Avail: NTIS HC A02/MF A01 CSCL 01A

The aerodynamic characteristics for a winged and wingless cruciform missile configuration were examined. The configuration had an ogive-cylinder body with a 3.5 caliber forebody; an overall length-to-diameter ratio of 11.667; and had cruciform tails that were trapezoidal in planform. Tests were made both with and without 72.9 degree cruciform delta wings. The investigation was made for Mach numbers from 1.50 to 4.63, roll attitudes of 0 degrees and 45 degrees, angles of attack from -4 degrees to 22 degrees, and tail control deflections from 10 degrees to -40 degrees. Author

**N83-17507*#** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
**LIMITED FLIGHT TEST EXPERIENCE WITH A LASER TRANSIT VELOCIMETER Final Report**
Robert E. Curry Feb. 1983 13 p refs
(NASA-TM-84896; NAS 1.15:84896) Avail: NTIS HC A02/MF A01 CSCL 01A

Limited flight testing of a laser transit velocimeter provided insight into the problems associated with the use of such instruments for flight research. Although the device tested was not designed for flight application, it had certain features such as fiber optics and low laser power which are attractive in the airborne environment. During these tests, operation of the velocimeter was limited by insufficient concentrations of light-scattering particles and background light interference. Normal operation was observed when these conditions were corrected by utilizing cloud particles and flying at night. A comparison between the laser flow velocity measurements and corresponding pressure measurements is presented and shows a coarse correlation. Statistical bias due to turbulence in the flow is suspected to have affected the laser measurements. Author

**N83-17508*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
**EFFECT OF EXTERNAL STORES ON THE STABILITY AND CONTROL CHARACTERISTICS OF A DELTA WING FIGHTER MODEL AT MACH NUMBERS FROM 0.60 TO 2.01**
M. Leroy Spearman Jan. 1983 38 p refs
(NASA-TM-84596; NAS 1.15:84596) Avail: NTIS HC A03/MF A01 CSCL 01A

An investigation has been made to determine the effects of external stores on the stability and control characteristics of a delta wing fighter airplane model at Mach numbers from 0.60 to 2.01 for a Reynolds number of 3.0 X 1 million per foot. The angle-of-attack range was from about -4 degrees to 20 degrees at a sideslip angle of 0 degrees for the transonic tests, and from about -4 degrees to 10 degrees at sideslip angles of 0 degrees and 3 degrees for the supersonic tests. In general, the results of the tests indicated no seriously detrimental effects of the stores on the stability and control characteristics of the model but did show an increase in the minimum drag level throughout the Mach number range. However, the drag-due-to-lift was such that for subsonic/transonic speeds, the drag at higher lifts was essentially unaffected and the indications are that the maneuvering capability may not be impaired by the stores. Author

**N83-17509*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
**TURBOFAN BLADE STRESSES INDUCED BY THE FLOW DISTORTION OF A VTOL INLET AT HIGH ANGLES OF ATTACK**
Robert C. Williams, James H. Diedrich, and Robert J. Shaw Jan. 1983 25 p refs
(NASA-TM-82963; E-1380; NAS 1.15:82963) Avail: NTIS HC A02/MF A01 CSCL 01A

A 51-cm-diameter turbofan with a tilt-nacelle VTOL inlet was tested in the Lewis Research Center's 9- by 15-Ft Low Speed Wind Tunnel at velocities up to 72 m/s and angles of attack up to 120 deg. Fan-blade vibratory stress levels were investigated over a full aircraft operating range. These stresses were due to inlet air flow distortion resulting from (1) internal flow separation in the inlet, and (2) ingestion of the exterior nacelle wake. Stress levels are presented, along with an estimated safe operating envelope, based on infinite blade fatigue life. Author

**N83-17510*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
**THE MINIMIZATION OF PYLON-MOUNTED STORE EFFECTS ON AIR COMBAT CAPABILITY**
M. Leroy Spearman Jan. 1983 16 p refs
(NASA-TM-84597; NAS 1.15:84597) Avail: NTIS HC A02/MF A01 CSCL 01A

Some effects of pylon-mounted missiles on aft-tail delta wing supersonic fighter concepts have been investigated. Whereas minimum drag penalties do occur with the addition of missiles, the effects at higher lifts, corresponding to maneuvering flight, are less severe and often favorable. Lower speeds and altitudes enhance the maneuvering capability and one-on-one air combat would probably tend to degenerate to subsonic speeds even though the combatants may be flying supersonic fighters. Higher speed (supersonic) flight might best be reserved for interceptors with long-range missiles where the weapon carriage effects at low angles of attack are of prime importance. Author

**N83-17511*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
**THE ROLE OF WIND TUNNELS IN PREDICTING SOUNDING ROCKET AERODYNAMICS**
M. Leroy Spearman Jan. 1983 11 p refs
(NASA-TM-84599; NAS 1.15:84599) Avail: NTIS HC A02/MF A01 CSCL 01A

The nature of some cases of flow separation, flow-field interference, unusual vehicle shape or size, excessive deviations to high angular positions, Mach number induced effects, Reynolds number effects, and effects of protruberances on wind tunnel investigations of sounding rockets are illustrated. Author

**N83-17512*#** United Technologies Corp., East Hartford, Conn.
**ANALYSIS OF UNSWEPT AND SWEPT WING CHORDWISE PRESSURE DATA FROM AN OSCILLATING NACA 0012 AIRFOIL EXPERIMENT. VOLUME 2: DATA REPORT**
A. O. St.Hilaire and F. O. Carta Jan. 1983 313 p refs
(Contract NAS1-16041)
(NASA-CR-165927; NAS 1.26:165927) Avail: NTIS HC A14/MF A01 CSCL 01A

The analysis of the chordwise load distribution and its sensitivity to the various system parameters represents the next phase of the overall study and is the subject of the present two volume report. The present volume is a compilation of all of the time history response data obtained during the test program previously described. The data have been tabulated in the form of Fourier coefficients for reasons of compactness and for ease by the user to reproduce the unsteady component of the individual pressures and the complete (unsteady plus steady state components) integrated load results. This data volume contains the individual pressure response time histories along the chord followed by the corresponding integrated load results. A further description of these data tables can be found in the text that follows. B.W.

**N83-17513*#** General Dynamics/Fort Worth, Tex.
**THEORETICAL EVALUATION OF A V/STOL FIGHTER MODEL UTILIZING THE PAN AIR CODE Final Report, Oct. 1981 - Aug. 1982**
G. A. Howell and I. C. Bhateley Sep. 1982 101 p refs
(Contract NAS2-10649)
(NASA-CR-166395; NAS 1.26:166395) Avail: NTIS HC A06/MF A01 CSCL 01A

The PAN AIR computer code was investigated as a tool for predicting closely coupled aerodynamic and propulsive flowfields of arbitrary configurations. The NASA/Ames V/STOL fighter model, a configuration of complex geometry, was analyzed with the PAN AIR code. A successful solution for this configuration was obtained

when the nozzle exit was treated as an impermeable surface and no wakes were included around the nozzle exit. When separated flow was simulated from the end of the nacelle, requiring the use of wake networks emanating from the nozzle exit, a number of problems were encountered. A circular body nacelle model was used to investigate various techniques for simulating the exhaust plume in PAN AIR. Several approaches were tested and eliminated because they could not correctly simulate the interference effects. Only one plume modeling technique gave good results. A PAN AIR computation that used a plume shape and inflow velocities obtained from the Navier-Stokes solution for the plume produced results for the effects of power that compared well with experimental data. Author

**N83-17514#** Indian Inst. of Tech., Kanpur. Dept. of Aeronautical Engineering.

**HYPERSONIC SECOND ORDER MERGED LAYERS ON BLUNT BODIES**

A. C. Jain and Saroj Prabha Aug. 1982 61 p refs Sponsored by Indian Dept. of Space

Avail: NTIS HC A04/MF A01

The hypersonic merged layer regime in the stagnation zone of a spherical blunt body is investigated on the basis of full Navier-Stokes equations. Series expansions of the flow and thermodynamic variables are assumed. It is supposed that merged layer thickness varies with the distance downstream the stagnation point. The effect of this asymmetry in the merged layer thickness is incorporated in the formulation of the problem. Equations governing the first two indented terms of the series expansions with asymmetry effects are derived. The effect of asymmetry appears in the equations governing the leading terms of expansions, which are strictly valid at the stagnation line of the body. These equations are integrated numerically from the body to the free stream by the method of successive accelerated replacement. S.L.

**N83-17515*#** General Dynamics Corp., Fort Worth, Tex.

**DEVELOPMENT OF AERODYNAMIC PREDICTION METHODS FOR IRREGULAR PLANFORM WINGS Final Report**

David B. Benepe, Sr. Washington NASA Feb. 1983 477 p refs

(Contract NAS1-15073)

(NASA-CR-3664; NAS 1.26:3664) Avail: NTIS HC A21/MF A01 CSCL 01A

A set of empirical methods was developed to predict low-speed lift, drag and pitching-moment variations with angle of attack for a class of low aspect ratio irregular planform wings suitable for application to advanced aerospace vehicles. The data base, an extensive series of wind-tunnel tests accomplished by the Langley Research Center of the National Aeronautics and Space Administration, is summarized. The approaches used to analyze the wind tunnel data, the evaluation of previously existing methods, data correlation efforts, and the development of the selected methods are presented and discussed. A summary of the methods is also presented to document the equations, computational charts and design guides which have been programmed for digital computer solution. Comparisons of predictions and test data are presented which show that the new methods provide a significant improvement in capability for evaluating the landing characteristics of advanced aerospace vehicles during the preliminary design phase of the configuration development cycle. Author

**N83-17516#** Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Bereich Wissenschaftlich-Technische.

**A UNIVERSAL THREE-DIMENSIONAL WALL PRESSURE CORRECTION METHOD FOR CLOSED RECTANGULAR SUBSONIC WIND TUNNEL TEST SECTIONS (DISPLACEMENT, DOWNWASH, STREAM LINE CURVATURE)**

Gerhard Schulz Apr. 1982 76 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-800)

(DFVLR-FB-82-19) Avail: NTIS HC A05/MF A01; DFVLR, Cologne DM 28,10

A wall pressure correction method for closed rectangular subsonic test sections is presented. It corrects displacement, downwash and streamline curvature for models of arbitrary size, shape, position, and bulkiness respectively. Nevertheless the number of the necessary wall pressure measurement points is kept low, so he measurement duration time must not be enlarged with respect to the correction procedure. This is achieved by choice of special wall pressure places. The method can be extended to any cross section shapes of the test section. An experimental examination of the method gave good results as well for high lift measurements as especially for blickage correction in presence of large wake region behind the model. Author

**N83-17517#** Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany). Forschungsbereich Stroemungsmechanik.

**COMPUTATION OF THE FLOW AROUND WINGS WITH REAR SEPARATION**

Klaus Jacob Jul. 1982 48 p refs

(DFVLR-FB-82-22) Avail: NTIS HC A03/MF A01; DFVLR, Cologne DM 16

A prediction method for the subsonic flow around wings of transport aircrafts at high angles of attack is presented. The method combines an inviscid 3d lifting surface theory with a 2d airfoil theory, which includes boundary layer calculations and a displacement model for rear separation. The total iterative procedure allows for predictin the complete wing characteristics including maximum lift and post stall, but is restricted to wings with moderate to high aspect ratio and low sweep. Some results for such wings are shown and partly compared with experiments, including pressure distributions, separation lines, and total lift and drag characteristics. Author

**N83-17518#** Aeronautical Research Inst. of Sweden, Stockholm. Structures Dept.

**SIMPLIFIED FREE WAKE ANALYSIS FOR ROTORS**

Rene H. Miller (MIT, Cambridge, Mass.) Aug. 1982 88 p refs (Contract NE-5061-014; NE Proj. HU-2262:1)

(FFA-TN-1982-07; ASRL-TR-194-3) Avail: NTIS HC A05/MF A01

This report is concerned with the development of a technique for the aerodynamic analysis of rotary wing devices such as wind turbines and helicopters which would be free of the limiting assumptions of existing methods of analysis. For example, although the classical Rankine/Froude momentum theory has proven to be a reliable design tool, at least for preliminary performance estimates, the rotor is modeled as an actuator disc which implies an infinite number of blades. It therefore cannot be used to predict blade loading distributions, nor the effect of the number of blades on performance, or the noise signature in the presence of nonuniform flows due, for example, to tower shadow. These effects are all strongly influenced by aerodynamic interaction between blades, specifically between a blade and the vortices generated by the preceding blade. It is therefore necessary to have resource to the more powerful, but more complex, vortex theories of classical fluid mechanics. Author

**N83-17519#** Polytechnic Inst. of New York, Farmingdale. Dept. of Mechanical and Aerospace Engineering.

**HYPERSONIC AND OTHER VISCOUS INTERACTIONS Final Report, 1 Oct. 1980 - 31 Mar. 1982**

Robert J. Cresci and Martin H. Bloom Jun. 1982 24 p refs (Grant AF-AFOSR-0018-81; AF Proj. 2307)

(AD-A121237; POLY-M/AE-82-10; AFOSR-82-0890TR) Avail: NTIS HC A02/MF A01 CSCL 20/4

Surface heat transfer and boundary layer transition measurements have been performed on a slender blunted cone at M(infinity) = 8.0. These measurements have been obtained on the conical surface with mass transfer occurring on the spherical nose cap. The free stream Reynolds number, based on nose radius, varied between 6000 and 90000. Data was obtained both at zero angle of attack and at angles as high as 14 deg, which exceeds the

semi-vortex cone angle of 10 deg. The technique utilized in the determination of transition location was a thin film gauge, on the model surface, which was maintained at a constant temperature by an anemometer system. The RMS output of the film gauge was found to accurately locate the onset of boundary layer transition. A numerical analysis of film cooling in the stagnation region of a slender cone was also performed using the thin shock layer approximation. The porous region was analyzed and compared to previously obtained results using different assumptions. The downstream region, at angle of attack, utilize the porous region results as initial conditions. The computer program, however, was not successfully operated in this mode. GRA

**N83-17520#** Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Unternehmensbereich Drehfluegler.
**TRANSONIC EFFECTS ON HELICOPTER ROTOR BLADES**
H. Huber, V. Mikulla, and H. Stahl 1982 13 p refs Presented at DGLR Symp. on Aeroelasticity, Nuernberg, West Germany, 5-7 Oct. 1981
(MBB-349-81-O-E) Avail: Issuing Activity

The transonic environment of the helicopter rotor is summarized and the consequences for helicopter high speed behavior are discussed. Numerical methods capable of partially calculating the supercritical flow over the rotor blades are reviewed. Results of computational and experimental (model testing) investigations show that unsteadiness is a major feature of transonic rotor flow. Developments in the field of rotor airfoils and blade tip shapes, optimized under various aspects of transonic and separated flow environment, are discussed. Author (ESA)

**N83-17521#** Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Unternehmensbereich Drehfluegler.
**STUDIES ON BLADE-TO-BLADE AND ROTOR-FUSELAGE-TAIL INTERFERENCES**
H. Huber and G. Polz 7 May 1982 19 p refs Presented at AGARD Fluid Dyn. Panel Specialists' Meeting on Prediction of Aerodyn. Loads on Rotorcraft, London, 17-18 May 1982
(MBB-351-82-O-E) Avail: Issuing Activity

Analytical modeling techniques for helicopter blade-to-blade vortex interaction including prescribed-contracted-wake analysis, and free-wake models are described and results of analytical investigations are discussed. Experimental results obtained from in-flight blade model bending measurements are presented. Interactional aerodynamic flow from the fuselage to the rotor blades is treated. Analytical investigations, using a singularity model for the flow calculation around the fuselage body, are described. Parametric influences of the rotor-fuselage separation distance are shown. Interference flow effects between the rotor head and fuselage to the tail area were investigated. For the analytical representation of the steady interference flow, a model containing separated flow calculation is used. Experimental results, including steady pressure contours and dynamic pressure and flow angle fluctuations at the empennage/tail rotor area, are shown.
Author (ESA)

**N83-17522#** Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Unternehmensbereich Drehfluegler.
**FORCE INITIATIONS IN HELICOPTER ROTOR BLADES, WIND CHANNEL FANS AND WIND TURBINES [KRAFTEINIEITUNGEN IN BLAETTER FUER ROTOREN VON HUBSCHRAUBERN, WINDKANALGEBLAESEN UND WINDTURBINEN]**
Hahn 26 May 1982 28 p refs In GERMAN Presented at DGLR Symp. on Entwicklung und Anwendung von CFK-Strukt., Stuttgart, 26-27 May 1982
(MBB-UD-356-82-O) Avail: Issuing Activity

The force initiations in fiber reinforced composite rotor blades for front and rear helicopter rotors, wind tunnel fan rotors, and wind energy turbines were investigated. The force initiations are determined by the blade technology as well as by the rotor hub design. Blade connection domains were proposed, which in their construction and design propose different solutions, corresponding to the different applications. Glass fiber reinforced composites, carbon fiber reinforced composites and mixed constructions with manually impregnated laminates and prepregs were studied. Statistical force initiation calculations were compared with tests on specimen and components. Author (ESA)

**N83-17471#** Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France). Aerodynamics Dept.
**THE ROLE OF ANALYSIS IN THE AERODYNAMIC DESIGN OF ADVANCED ROTORS**
L. Dadone *In* AGARD Prediction of Aerodyn. Loads on Rotorcraft Sep. 1982 12 p refs (For primary document see N83-17470 08-01)
Avail: NTIS HC A14/MF A01

**N83-17472#** Westland Aircraft Ltd., Hayes (England).
**REPRESENTATION OF AIRFOIL BEHAVIOUR**
T. S. Beddoes *In* AGARD Prediction of Aerodyn. Loads on Rotorcraft Sep. 1982 11 p refs (For primary document see N83-17470 08-01)
Avail: NTIS HC A14/MF A01

**N83-17473#** Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
**STUDIES OF AEROFOILS AND BLADE TIPS FOR HELICOPTERS**
J. J. Thibert and J. J. Philippe *In* AGARD Prediction of Aerodyn. Loads on Rotorcraft Sep. 1982 14 p refs In FRENCH; ENGLISH summary (For primary document see N83-17470 08-01)
Avail: NTIS HC A14/MF A01

**N83-17474#** Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany).
**CALCULATION OF 3D UNSTEADY TRANSONIC FLOW AROUND ROTOR BLADES**
H. Stahl *In* AGARD Prediction of Aerodyn. Loads on Rotorcraft Sep. 1982 13 p refs (For primary document see N83-17470 08-01)
Avail: NTIS HC A14/MF A01

**N83-17477#** Institut de Mecanique des Fluides de Toulouse (France). Inst. de Mecanique.
**PREDICTION AND EXPERIMENTAL VERIFICATION OF THE VELOCITY FIELDS OF A ROTOR DURING HOVERING [PREDICTION ET VERIFICATION EXPERIMENTALE DU CHAMP DES VITESSES D'UN ROTOR EN VOL STATIONNAIRE]**
C. Maresca, M. Nsi Mba, and D. Favier *In* AGARD Prediction of Aerodyn. Loads on Rotorcraft Sep. 1982 18 p refs In FRENCH (For primary document see N83-17470 08-01)
Avail: NTIS HC A14/MF A01

**N83-17478#** Bell Helicopter Co., Fort Worth, Tex. Aerodynamics Technology Dept.
**VELOCITY COUPLING. A NEW CONCEPT FOR HOVER AND AXIAL FLOW WAKE ANALYSIS AND DESIGN**
J. David Kocurek and Lenard F. Berkowitz *In* AGARD Prediction of Aerodyn. Loads on Rotorcraft Sep. 1982 13 p refs (For primary document see N83-17470 08-01)
Avail: NTIS HC A14/MF A01

**N83-17479#** Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany).
**STUDIES ON BLADE-TO-BLADE AND ROTOR-FUSELAGE-TAIL INTERFERENCES**
H. Huber and G. Polz *In* AGARD Prediction of Aerodyn. Loads on Rotorcraft Sep. 1982 16 p refs (For primary document see N83-17470 08-01)
Avail: NTIS HC A14/MF A01

**N83-17480#** Pisa Univ. (Italy). Istituto di Macchine.
**ROTOR-FUSELAGE INTERFERENCE ON ENGINE INTERNAL AERODYNAMICS IN MANEUVERING HIGH-SPEED ROTORCRAFT**
Dino Dini *In* AGARD Prediction of Aerodyn. Loads on Rotorcraft Sep. 1982 14 p refs (For primary document see N83-17470

08-01)
Avail: NTIS HC A14/MF A01

**N83-17481#** Royal Aircraft Establishment, Farnborough (England). Structures Dept.
**DEVELOPMENT OF THE VORTEX RING WAKE MODEL AND ITS INFLUENCE ON THE PREDICTION OF ROTOR LOADS**
C. Young *In* AGARD Prediction of Aerodyn. Loads on Rotorcraft Sep. 1982 13 p refs (For primary document see N83-17470 08-01)
Avail: NTIS HC A14/MF A01

**N83-17484#** Sikorsky Aircraft, Stratford, Conn. Aeromechanics Dept.
**REVIEW OF ROTOR LOADS PREDICTION METHODS**
Peter J. Arcidiacono and Robert Sopher *In* AGARD Prediction of Aerodyn. Loads on Rotorcraft Sep. 1982 18 p refs (For primary document see N83-17470 08-01)
Avail: NTIS HC A14/MF A01

**N83-17486#** Societe Nationale Industrielle Aerospatiale, Marseille (France).
**METHODS USED AT AEROSPATIALE FOR CALCULATING THE LOADS ON A ROTOR AND EXPERIMENTAL CROSS CHECKS [METHODES DE CALCUL DES CHARGES SUR ROTOR UTILISEES A L'AEROSPATIALE ET RECOUPEMENTS EXPERIMENTAUX]**
B. Masure and Vuillet *In* AGARD Prediction of Aerodyn. Loads on Rotorcraft Sep. 1982 13 p refs In FRENCH (For primary document see N83-17470 08-01)
Avail: NTIS HC A14/MF A01

**N83-17487#** Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Inst. fuer Flugmechanik.
**COMPARISON OF ROTOR ANALYSIS RESULTS WITH AERODYNAMIC WINDTUNNEL DATA**
H.-J. Langer, W. V. Gruenhagen, and B. Junker *In* AGARD Prediction of Aerodyn. Loads on Rotorcraft Sep. 1982 13 p refs (For primary document see N83-17470 08-01)
Avail: NTIS HC A14/MF A01

**N83-17488#** Royal Aircraft Establishment, Bedford (England). Flight Systems Dept.
**AN APPRAISAL OF ROTOR BLADE-TIP VORTEX INTERACTION AND WAKE GEOMETRY FROM FLIGHT MEASUREMENTS**
P. Brotherhood *In* AGARD Prediction of Aerodyn. Loads on Rotorcraft Sep. 1982 14 p refs (For primary document see N83-17470 08-01)
Avail: NTIS HC A14/MF A01

# 03 AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation.*

**N83-17523*#** Ohio State Univ., Columbus. Dept. of Aviation.
**STATISTICAL SUMMARY: STUDY TO DETERMINE THE IFR OPERATIONAL PROFILE OF THE GENERAL AVIATION SINGLE PILOT Final Report**
G. S. Weislogel and G. C. Chapman May 1982 184 p refs (Contract NAS1-15969)
(NASA-CR-165805; NAS 1.26:165805) Avail: NTIS HC A09/MF A01 CSCL 05J

The statistical summary of data resulting from a mail questionnaire survey designed to develop information on the general aviation single pilot operating under instrument flight rules is presented. Author

**N83-17524#** Federal Aviation Administration, Atlantic City, N.J.
**EQUIVALENCY EVALUATION OF FIREFIGHTING AGENTS AND MINIMUM REQUIREMENTS AT US AIR FORCE AIRFIELDS Final Report, 9 Jan. 1979 - Nov. 1982**
George B. Geyer, John ONeill, and Charles H. Urban Oct. 1982 140 p refs
(FAA-CT-82-109) Avail: NTIS HC A07/MF A01

An evaluation of selected aircraft firefighting agents was made both blanketing and auxiliary and of dispersing equipment. Laboratory studies and outdoor fire tests were conducted to ascertain the fire extinguishing equivalency of the auxiliary agents and to determine the most acceptable agents and equipment for use in performing large scale firefighting tests. Author

**N83-17525*#** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
**FIRE BLOCKING SYSTEMS FOR AIRCRAFT SEAT CUSHIONS Patent Application**
John A. Parker and Demetrius A. Kourtides, inventors (to NASA) Filed 23 Dec. 1982 22 p
(NASA-Case-ARC-11423-1; US-Patent-Appl-SN-452466) Avail: NTIS HC A02/MF A01 CSCL 01C

A system for fire blocking in aircraft cushions by minimizing release of flammable gaseous decomposition products is disclosed. The system employs a catalytic matrix which cracks the flammable gaseous decomposition products to less flammable species. The system uses a non-fire retarded polyurethane cushion surrounded by an aramid matrix which is in turn covered with an aluminum film, e.g., aluminized Norfab 11 HT-26-AL. This matrix can be used alone or in combination with one or more additional coverings which enhance the contact of the combustible vapors with the catalytic matrix. These catalytic matrix materials are relatively light weight and permit a reasonably priced final product. The role of aluminum film is two fold: first it serves as a delocalizing heat conductor; and second, it provides a vapor barrier to increase the residence time of gases in the fabric thereby enhancing pryolysis and char-layer formation. NASA

**N83-17526#** General Dynamics Corp., Fort Worth, Tex.
**ADVANCED ULTRA-VIOLET (UV) AIRCRAFT FIRE DETECTION SYSTEM. VOLUME 1: SYSTEM DESCRIPTION AND FLIGHT TEST Final Report, 15 Dec. 1977 - 26 Oct. 1981**
R. J. Springer, P. H. Sheath, S. P. Robinson, and D. J. V. Smith Wright-Patterson AFB, Ohio AFWAL Aug. 1982 159 p refs
(Contract F33615-77-C-2029; AF Proj. 2348)
(AD-A121253; AFWAL-TR-82-2062-Vol-1) Avail: NTIS HC A08/MF A01 CSCL 01/2

The objective of this program was to utilize ultra-violet (UV) radiation technology to provide advanced means of detecting fire hazards more reliably and more rapidly than current thermally activated continuous cable type systems. The program was divided into four phases. The first phase consisted of analysis and design requirements followed by design and fabrication, environmental testing, and flight testing of the system on an F-111 high performance aircraft. The objectives of this program were met. Two ultra-violet (UV) detection systems were developed, fabricated and test flown. The flight test program demonstrated that the systems have a fire detection reliability and a freedom from false warnings that are significantly better than existing service equipment. One system, system A, includes a high degree of redundancy such as dual power supplies, dual sensors and dual microprocessors along with self checking and automatic reconfiguration. These features provide a reduction in pilot work load and reduction in unscheduled maintenance actions. The other system, system B, a simplified system, is based on the same design components as system A but only utilizes a single power supply, single sensor and a single microprocessor. Both systems are considered suitable for near-term service applications.
Author (GRA)

**N83-17463#** Northwest Airlines, Inc., Minneapolis, Minn.
**FUEL CONSERVATION TECHNIQUES IN JET TRANSPORT AIRCRAFT OPERATIONS**

H. H. Craven, Jr. *In* DOE Symp. on Com. Aviation Energy Conserv. Strategies Apr. 1981 p 137-146 (For primary document see N83-17455 08-01)
Avail: NTIS HC A17/MF A01 CSCL 01/2

**N83-17491#** School of Aerospace Medicine, Brooks AFB, Tex.
**AN OVERVIEW OF HUMAN FACTORS IN AIRCRAFT ACCIDENTS AND INVESTIGATIVE TECHNIQUES**
B. O. Hartman *In* AGARD Human Factors Aspects of Aircraft Accidents Oct. 1982 4 p refs (For primary document see N83-17490 08-01)
Avail: NTIS HC A07/MF A01

**N83-17492#** Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
**HUMAN FACTORS IN AIRCRAFT ACCIDENTS: PRESENT STATUS AND SIGNIFICANT CONCERNS [ASPECTS DES FACTEURS HUMAINS DANS LES ACCIDENTS D'AVIATION: STATUT ACTUEL ET SOUCIS SIGNIFICATIFS]**
M. Vigier *In its* Human Factors Aspects of Aircraft Accidents Oct. 1982 20 p In FRENCH (For primary document see N83-17490 08-01)
Avail: NTIS HC A07/MF A01

**N83-17493*#** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
**THE INFLUENCE OF HANDLING QUALITIES, CRASHWORTHINESS AND OTHER ENGINEERING FACTORS ON AIRCRAFT SAFETY**
Seth B. Anderson *In* AGARD Human Factors Aspects of Aircraft Accidents Oct. 1982 11 p refs (For primary document see N83-17490 08-01)
Avail: NTIS HC A07/MF A01 CSCL 01C

**N83-17497*#** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
**THE ENGINEERING INVESTIGATION OF AIRCRAFT ACCIDENTS**
Seth B. Anderson *In* AGARD Human Factors Aspects of Aircraft Accidents Oct. 1982 8 p refs (For primary document see N83-17490 08-01)
Avail: NTIS HC A07/MF A01 CSCL 01C

# 04 AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command, and Tracking* and *32 Communications.*

**N83-17527** Royal Aircraft Establishment, Farnborough (England).
**DEVELOPMENT OF THE PRECISION APPROACH PATH INDICATOR LIGHT UNIT**
A. J. Smith Jul. 1982 31 p refs
(RAE-TM-FS(B)-483; BR84981) Copyright. Avail: Issuing Activity

The Precision Approach Path Indicator (PAPI) is a simple visual aid we developed to assist pilots during approach to landing. The PAPI system uses a set of four two-color high intensity light projectors. Each beam consists of a white upper half and red lower half. The transition from one color to the other occurs over a small angle. This sharp transition is an essential feature of the PAPI system and it is therefore important that all units should exhibit this characteristic. Similarly, operational considerations dictate the minimum beam-spread and intensity requirements for the light projectors. It is essential that the correct isocandela specification is adhered to in all PAPI units. Since the PAPI light units incorporate a projector lens it is necessary to engineer the units so as to prevent the degradation of the signal that occur dues to the presence of water droplets or ice particles on the surfaces of the lenses and any protecting windows. Various optical and engineering design parameters are reviewed, and test procedures and engineering solutions that have been developed to ensure that they are met are described. J.M.S.

**N83-17459#** Systems Control, Inc., West Palm Beach, Fla. Technology Industries Div.
**THE ANALYSIS OF INTEGRATED FUEL EFFICIENT, LOW NOISE PROCEDURES IN LAX TERMINAL AREA OPERATIONS**
John B. McKinley and Robert L. Bowles (FAA) *In* DOE Symp. on Com. Aviation Energy Conserv. Strategies Apr. 1981 p 57-78 refs Originally announced as N82-13014 (For primary document see N83-17455 08-01)
Avail: NTIS HC A17/MF A01 CSCL 01/2

**N83-17461*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
**AIRLINE FLIGHT PLANNING: THE WEATHER CONNECTION**
Robert Steinberg *In* DOE Symp. on Com. Aviation Energy Conserv. Strategies Apr. 1981 p 103-126 refs Previously announced as A82-24386 (For primary document see N83-17455 08-01)
Avail: NTIS HC A17/MF A01 CSCL 01/2

**N83-17464#** Eastern Air Lines, Inc., Atlanta, Ga. Air Traffic Systems Dept.
**AIR TRAFFIC CONTROL: ITS EFFECT ON FUEL CONSERVATION**
Edwin H. Price *In* DOE Symp. on Com. Aviation Energy Conserv. Strategies Apr. 1981 p 147-162 (For primary document see N83-17455 08-01)
Avail: NTIS HC A17/MF A01 CSCL 01/2

# 05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.

For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics.*

**N83-17528#** National Aerospace Lab., Tokyo (Japan). Flight Analysis Team.
**FLIGHT SIMULATION TEST OF NATIONAL AEROSPACE LABORATORY STOL-RESEARCH-AIRCRAFT. PART 1: STOL CONFIGURATION**
1982 163 p refs In JAPANESE; ENGLISH summary
(NAL-TR-713-Pt-1; ISSN-0389-4010) Avail: NTIS HC A08/MF A01

A fixed-base visual simulation study has been conducted to evaluate the airworthiness and the flying quality of the NAL Quiet fan-jet STOL Research Aircraft having a high wing and equipped with a upper surface blowing flap in combination with four high bypass-ratio fan-jet engines. Real-time digital simulation techniques were used. The computer was programmed with equations of motion for six degrees of freedom and the aerodynamic inputs were based on measured wind-tunnel data. A visual display of a STOL airport was provided for simulation of the flare and touch down characteristics. Flight missions to be executed by pilots are: (1) approach and landing, (2) engine failure, (3) approach to stall and recovery and (4) take-off. The airworthiness and flying quality of NAL QSRA were evaluated by pilot opinion and rating, the observation and analysis of time history and the many statistical data recorded during the simulation. Author

**N83-17529#** National Aerospace Lab., Tokyo (Japan).
**GENERAL PURPOSE FLIGHT SIMULATION PROGRAM (FSPK-1). PART 1: CONTENTS OF THE PROGRAM**
Toshio Bando and Akira Watanabe Feb. 1982 66 p refs In JAPANESE; ENGLISH summary
(NAL-TR-702; ISSN-0389-4010) Avail: NTIS HC A04/MF A01

The FSPK-1 simulation program which simulates large nonlin-

ear aircraft motion and is intended as an integrated design tool in the development of an aircraft is discussed. It was used in the simulation tests for quiet-STOL experimental aircraft to demonstrate its effectiveness. Characteristics, advantages, and limitations include (1) an operation based on the fixed point method with the objective aircraft limited to a medium subsonic aircraft of moderate motion, (2) high general applicability, (3) an aerodynamic model of the program, with empenage contributions with nonlinearity independently calculated, (4) the effect of aircraft motion on engine failure accurately evaluated by an engine failure conversion coefficient, (5) an automatic trim capability to start the simulation at any flight point, (6) independent calculation for control response and gust response etc., and (7) a fixed based cockpit. S.L.

**N83-17530*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
**PERFORMANCE OF HIGH-ALTITUDE, LONG-ENDURANCE, TURBOPROP AIRPLANES USING CONVENTIONAL OR CRYOGENIC FUELS**
Grace C. Liu, Charles E. K. Morris, Jr., and Robert W. Koenig Jan. 1983 54 p refs
(NASA-TM-84534; NAS 1.15:84534) Avail: NTIS HC A04/MF A01 CSCL 01C

An analytical study has been conducted to evaluate the potential endurance of remotely piloted, low speed, high altitude, long endurance airplanes designed with 1990 technology. The baseline configuration was a propeller driven, sailplane like airplane powered by turbine engines that used JP-7, liquid methane, or liquid hydrogen as fuel. Endurance was measured as the time spent between 60,000 feet and an engine limited maximum altitude of 70,000 feet. Performance was calculated for a baseline vehicle and for configurations derived by varying aerodynamic, structural or propulsion parameters. Endurance is maximized by reducing wing loading and engine size. The level of maximum endurance for a given wing loading is virtually the same for all three fuels. Constraints due to winds aloft and propulsion system scaling produce maximum endurance values of 71 hours for JP-7 fuel, 70 hours for liquid methane, and 65 hours for liquid hydrogen. Endurance is shown to be strongly effected by structural weight fraction, specific fuel consumption, and fuel load. Listings of the computer program used in this study and sample cases are included in the report. Author

**N83-17531#** National Aerospace Lab., Amsterdam (Netherlands). Flight Div.
**A CONTROL MODEL FOR MANEUVERING FLIGHT FOR APPLICATION TO A COMPUTER FLIGHT TESTING PROGRAM**
H. Haverdings 31 Jul. 1981 18 p refs Presented at 7th European Rotorcraft and Powered Lift Aircraft Forum, Garmisch-Partenkirchen, West Ger., 8-11 Sep. 1987 Sponsored by Royal Netherlands Air Force Directorate of Material
(NLR-MP-81046-U) Avail: NTIS HC A02/MF A01

A computer-flight-testing (CFT) program for helicopters was developed to evaluate helicopter dynamics and handling and control qualities. The nonlinear 6 degrees of freedom helicopter model is driven by control inputs by a specially developed control model (or pseudo pilot). This is an adaptation of a linear optimal control model as used in human factor analysis. The helicopter model is based on two dimensional strip aerodynamics and steady-state rotor blade dynamics using only out-of-plane bending mode shapes, which are suitable for various types of rotor articulation. The pilot model consists of a flight path generation (FPG) model and a stabilization (STAB) model. The FPG model is based on linearized system dynamics using terminal optimal control, generating both the required flight path and the control inputs to achieve it. These controls are input into the helicopter model. The two flight paths are compared, and differences are fed back to the STAB model to generate corrective control inputs of such a nature that the helicopter-model-generated flight path tracks the required flight path generated by the FPG model. Also the STAB model is based on linearized system dynamics. As an example, two flare maneuvers are 'flown', and the results discussed. The pseudo-pilot model merforms well, provided that helicopter dynamics do not change much during a specific maneuver. J.M.S.

**N83-17532#** National Aerospace Lab., Amsterdam (Netherlands). Structures and Materials Div.
**PREDICTED AND MEASURED LANDING GEAR LOADS FOR THE NF-5 AIRCRAFT TAXIING OVER A BUMPY RUNWAY**
H. H. Ottens 28 Jan. 1982 18 p refs Presented at 54th AGARD Struct. and Mater. Panel, Brussels, 4-9 Apr. 1982
(Contract RB-KLU 1980-P59)
(NLR-MP-82008-U) Avail: NTIS HC A02/MF A01

A simple mathematical model of the NF-5A aircraft was developed. The model is validated by measured results. Landing gear loads are calculated for the aircraft taxiing across a repaired runway using an AM-2 mat. The results depend strongly on the heaving and pitching motion of the aircraft when it meets the repair. E.A.K.

**N83-17533#** Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Information und Dokumentation.
**THE USE OF HELICOPTERS IN EUROPE: ANALYSIS AND PROSPECTS [HUBSCHRAUBEREINSATZ IN EUROPA: ANALYSE UND AUSBLICK]**
Ludwig Boelkow 1982 20 p refs In GERMAN Presented at 14th Intern. Hubschrauberforum Bueckeburg, Hannover, 21 May 1982
(MBB-UD-359/82-O) Avail: Issuing Activity

The use of helicopters for civil applications in Europe is treated. In the period from 1974 to 1980 the number of civil helicopters in the countries of the European Community increased by 87%. The reasons for this increase are explained. Civil helicopters are very reliable; the average number of accidents is comparable with that of general civil aviation. Helicopters types used in Europe and the US are compared. An increase in use is predicted, although due to its limited speed the helicopter cannot be used economically for distances larger than 600 km. Author (ESA)

**N83-17759#** Joint Publications Research Service, Arlington, Va.
**ATR 42 WILL HAVE ULTRAMODERN, INNOVATIVE COCKPIT, AVIONICS**
Serge Brosselin *In its* West Europe Rept.: Sci. and Technol., No. 133 (JPRS-82608) 10 Jan. 1983 p 19-22 Transl. into ENGLISH from Aviation Mag. Intern. (France), 1 Nov. 1982 p 38-39
(For primary document see N83-17757 08-31)
Avail: NTIS HC A03/MF A01

**N83-17458#** Peat, Marwick, Mitchell and Co., San Francisco, Calif.
**AIRCRAFT TOWING FEASIBILITY STUDY**
Henry S. L. Fan and Dan G. Haney *In* DOE Symp. on Com. Aviation Energy Conserv. Strategies Apr. 1981 p 45-56 refs
(For primary document see N83-17455 08-01)
Avail: NTIS HC A17/MF A01 CSCL 01/2

# 06 AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography.*

**N83-17534*#** Ohio Univ., Athens. Avionics Engineering Center.
**COCKPIT WEATHER RADAR DISPLAY DEMONSTRATOR AND GROUND-TO-AIR SFERICS TELEMETRY SYSTEM Final Report, Dec. 1981 - Dec. 1982**
James D. Nickum and Daryl L. McCall [1982] 81 p refs
(Grant NAG1-124)
(NASA-CR-169830; NAS 1.26:169830; OU/AEC-EER-53-5) Avail: NTIS HC A05/MF A01 CSCL 01D

The results of two methods of obtaining timely and accurate severe weather presentations in the cockpit are detailed. The first method described is a course up display of uplinked weather radar

data. This involves the construction of a demonstrator that will show the feasibility of producing a course up display in the cockpit of the NASA simulator at Langley. A set of software algorithms was designed that could easily be implemented, along with data tapes generated to provide the cockpit simulation. The second method described involves the uplinking of sferic data from a ground based 3M-Ryan Stormscope. The technique involves transfer of the data on the CRT of the Stormscope to a remote CRT. This sferic uplink and display could also be included in an implementation on the NASA cockpit simulator, allowing evaluation of pilot responses based on real Stormscope data. Author

**N83-17535*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
**PLANNING FUEL-CONSERVATIVE DESCENTS WITH OR WITHOUT TIME CONSTRAINTS USING A SMALL PROGRAMMABLE CALCULATOR: ALGORITHM DEVELOPMENT AND FLIGHT TEST RESULTS**
Charles E. Knox Mar. 1983 39 p refs
(NASA-TP-2085; L-15389; NAS 1.60:2085) Avail: NTIS HC A03/MF A01 CSCL 01D

A simplified flight-management descent algorithm, programmed on a small programmable calculator, was developed and flight tested. It was designed to aid the pilot in planning and executing a fuel-conservative descent to arrive at a metering fix at a time designated by the air traffic control system. The algorithm may also be used for planning fuel-conservative descents when time is not a consideration. The descent path was calculated for a constant Mach/airspeed schedule from linear approximations of airplane performance with considerations given for gross weight, wind, and nonstandard temperature effects. The flight-management descent algorithm is described. The results of flight tests flown with a T-39A (Sabreliner) airplane are presented. Author

**N83-17536*#** National Aeronautics and Space Administration. Pasadena Office, Calif.
**SYSTEM FOR INDICATING FUEL-EFFICIENT AIRCRAFT ALTITUDE Patent Application**
Bruce L. Gary, inventor (to NASA) (JPL, California Inst. of Tech., Pasadena) Filed 26 Aug. 1982 19 p Sponsored by NASA
(NASA-Case-NPO-15351-2; US-Patent-Appl-SN-412039) Avail: NTIS HC A02/MF A01 CSCL 01D

A method and apparatus are provided for indicating the altitude at which an aircraft should fly so the W/d ratio (weight of the aircraft divided by the density of air) more closely approaches the optimum W/d for the aircraft. A passive microwave radiometer on the aircraft is directed at different angles with respect to the horizon, to determine the air temperature and therefore the density of the air, at different altitudes. The weight of the aircraft is known. The altitude of the aircraft is changed to fly the aircraft at an altitude at which its W/d ratio more closely approaches the optimum W/d ratio for that aircraft. NASA

**N83-17466#** Lufthansa German Airlines, Cologne (West Germany).
**SLIDESLIP INDICATION SYSTEM**
Dieter Horst *In* DOE Symp. on Com. Aviation Energy Conserv. Strategies Apr. 1981 p 209-230 Previously announced as N82-25181 (For primary document see N83-17455 08-01)
Avail: NTIS HC A17/MF A01 CSCL 01/2

# 07 AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

**N83-17537*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
**STATUS OF FIBEROPTICS TECHNOLOGY FOR PROPULSION CONTROL SYSTEMS**
Robert J. Baumbick 1982 12 p refs Presented at the Aerospace Congr. and Exposition, Anaheim, Calif., 25-28 Oct. 1982
(NASA-TM-82907; E-1291; NAS 1.15:82907) Avail: NTIS HC A02/MF A01 CSCL 21E

Optical sensors and optically controlled actuators for use in airbreathing engine control systems are discussed. The environmental conditions in which the aircraft will operate require the fiberoptic cables and optical connectors to perform reliably at temperatures over the -55 C to 260 C range. The status of fiberoptics technology for operation in this environment is reviewed. Author

**N83-17538*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
**VALIDATION OF A THREE-DIMENSIONAL VISCOUS ANALYSIS OF AXISYMMETRIC SUPERSONIC INLET FLOW FIELDS**
T. J. Benson and B. H. Anderson Jan. 1983 17 p refs Presented at the 21st Aerospace Sci. Conf., Reno, Nev., 10-13 Jan. 1983
(NASA-TM-83058; E-1523; NAS 1.15:83058) Avail: NTIS HC A02/MF A01 CSCL 21E

A three-dimensional viscous marching analysis for supersonic inlets was developed. To verify this analysis several benchmark axisymmetric test configurations were studied and are compared to experimental data. Detailed two-dimensional results for shock-boundary layer interactions are presented for flows with and without boundary layer bleed. Three dimensional calculations of a cone at angle of attack and a full inlet at attack are also discussed and evaluated. Results of the calculations demonstrate the code's ability to predict complex flow fields and establish guidelines for future calculations using similar codes. Author

**N83-17539*#** General Electric Co., Evendale, Ohio. Aircraft Engine Business Group.
**SUMMARY REPORT FOR CF6 JET ENGINE DIAGNOSTICS PROGRAM Final Report**
W. A. Fasching and R. Stricklin Oct. 1982 44 p refs
(Contract NAG3-20631)
(NASA-CR-165582; NAS 1.26:165582; R81-AEG-654) Avail: NTIS HC A03/MF A01 CSCL 01E

Cockpit cruise recordings and test cell data in conjunction with hardware inspection results from airline overhaul shops were analyzed to define the extent and magnitude of performance deterioration of the General Electric CF6 nigh bypass turbofan engines. The magnitude of Short Term deterioration from the Long Term was isolated and the individual damage mechanisms that were the cause for the majority of the performance deterioration were identified. A potential for reduction in compressor clearance and a potential for improvement in turbine roundness, which corresponds to cruise SFC reductions of 0.38 and 0.36 percent, respectively, were identified. Author

**N83-17540#** National Aerospace Lab., Tokyo (Japan). Aeroengine Div.
**ANALYSIS OF THE EFFECTS OF INLET GAS-FLOW CONDITIONS ON A HIGHLY-LOADED LOW-PRESSURE AXIAL-FLOW TURBINE PERFORMANCE**
Atsumasa Yamamoto, Hiroyuki Nouse, Mitsuhiro Minoda, Shigeo Inoue, and Hiroshi Usui Jul. 1982 16 p refs
(NAL-TR-719T; ISSN-0389-4010) Avail: NTIS HC A02/MF A01

An inlet distortion (ID) test was conducted to determine the effects of inlet pressure and/or inlet flow velocity distortions on overall performance of a highly-loaded axial-flow turbine. Two types of steel wire screens were used to produce two different axisymmetrical inlet distortion patterns. Decreases by a few percent in turbine efficiency due to these distortions were found, especially during the part-loaded operations. Simple analysis methods for the prediction of the effects were also tried. Author

**N83-17541#** National Aerospace Lab., Tokyo (Japan).
**PERFORMANCE EVALUATION METHOD FOR PREBURNER OF STAGED COMBUSTION CYCLE ENGINES**
Hiroshi Tamura, Yoshio Wakamatsu, and Fumiei Ono Jun. 1982 16 p refs
(NAL-TR-711T; ISSN-0389-4010) Avail: NTIS HC A02/MF A01

A performance evaluation method for the preburner of staged combustion cycle engines is proposed. Consideration of the turbopump power balance of a staged combustion cycle engine shows that improvements in staged combustion cycle engine performance can be attained by an increase in parameter A, which is related to the discharge pressure of the turbopump. Preburner performance is traditionally evaluated by means of C* efficiency and the spatial deviation of temperature. A working index of the preburner is defined and used as a preburner performance evaluation index. The index is defined as the ratio of the turbine power of the actual preburner gas to the turbine power of the ideal preburner gas. The index is shown to reflect a variation of the parameter A. A method to experimentally determine the index is also discussed. S.L.

**N83-17542*#** General Electric Co., Cincinnati, Ohio. Aircraft Engine Business Group.
**EQUIVALENT DAMAGE: A CRITICAL ASSESSMENT Final Report, Aug. 1980 - Dec. 1981**
J. R. Laflen and T. S. Cook Nov. 1982 203 p refs
(NASA-CR-167874; NAS 1.26:167874; R82AEG533) Avail: NTIS HC A10/MF A01 CSCL 21E

Concepts in equivalent damage were evaluated to determine their applicability to the life prediction of hot path components of aircraft gas turbine engines. Equivalent damage was defined as being those effects which influence the crack initiation life-time beyond the damage that is measured in uniaxial, fully-reversed sinusoidal and isothermal experiments at low homologous temperatures. Three areas of equivalent damage were examined: mean stress, cumulative damage, and multiaxiality. For each area, a literature survey was conducted to aid in selecting the most appropriate theories. Where possible, data correlations were also used in the evaluation process. A set of criteria was developed for ranking the theories in each equivalent damage regime. These criteria considered aspects of engine utilization as well as the theoretical basis and correlative ability of each theory. In addition, consideration was given to the complex nature of the loading cycle at fatigue critical locations of hot path components; this loading includes non-proportional multiaxial stressing, combined temperature and strain fluctuations, and general creep-fatigue interactions. Through applications of selected equivalent damage theories to some suitable data sets it was found that there is insufficient data to allow specific recommendations of preferred theories for general applications. A series of experiments and areas of further investigations were identified. Author

**N83-17543*#** Pratt and Whitney Aircraft Group, East Hartford, Conn. Commercial Products Div.
**THE JT8D AND JT9D ENGINE COMPONENT IMPROVEMENT: PERFORMANCE IMPROVEMENT PROGRAM Executive Summary Report**
W. O. Gaffin May 1982 32 p refs
(Contract NAS3-20630)
(NASA-CR-167965; NAS 1.26:167965; PWA-5515-177) Avail: NTIS HC A03/MF A01 CSCL 21E

The NASA sponsored Engine Component Improvement - Performance Improvement Program at Pratt & Whitney Aircraft advanced the state of the art of thermal barrier coatings and ceramic seal systems, demonstrated the practicality of an advanced turbine clearance control system and an advanced fan design in the JT9D engine, and demonstrated the advantages of modern cooling, sealing, and aerodynamic designs in the high pressure turbine and compressor of the JT8D engine. Several of these improvements are already in airline service in JT8D and JT9D engines, and others will enter service soon in advanced models of these engines. In addition, the technology advances are being transferred to completely new engine configurations, the PW2037 engine and the NASA sponsored Energy Efficient Engine. Author

**N83-17544*#** Pratt and Whitney Aircraft Group, East Hartford, Conn. Commercial Products Div.
**THE JT9D JET ENGINE DIAGNOSTICS PROGRAM Executive Summary Report**
W. J. Olsson May 1982 26 p refs
(Contract NAS3-20632)
(NASA-CR-167966; NAS 1.26:167966; PWA-5512-96) Avail: NTIS HC A03/MF A01 CSCL 21E

The various engine deterioration phenomena that affect JT9D performance retention were studied, and approaches to improve performance retention of engines were identified. The program included surveys of historical data, monitoring of in service engines, ground and flight testing of instrumented engines, analysis, and analytical modeling. Performance deterioration is made up of both short and long term modes, both of which are flight cycle related phenomena. Short term deterioration occurs primarily during airplane acceptance testing prior to delivery to the airline. This effect is caused by flight load and power induced clearance closures and engine deflections with resulting rubbing of airfoils and seals. Long term deterioration is caused by erosion of airfoils and gas path seals during ground operation and take off and by cyclic induced thermal distortion of the high pressure turbine airfoils. Studies of possible remedial approaches have shown that performance retention within 1 to 2 percent of initial revenue service performance can be achieved with a proper program of hot section and cold section maintenance. S.L.

**N83-17545*#** Curtiss-Wright Corp., Wood-Ridge, N.J.
**STUDY OF ADVANCED ROTARY COMBUSTION ENGINES FOR COMMUTER AIRCRAFT Final Report**
M. Berkowitz, C. Jones, and D. Myers Feb. 1983 58 p refs
(Contract NAS3-22140)
(NASA-CR-165399; NAS 1.26:165399; CW-WR-81-022F) Avail: NTIS HC A04/MF A01 CSCL 21E

Performance, weight, size, and maintenance data for advanced rotary aircraft engines suitable for comparative commuter aircraft system evaluation studies of alternate engine candidates are provided. These are turbocharged, turbocompounded, direct injected, stratified charge rotary engines. Hypothetical engines were defined (an RC4-74 at 895 kW and an RC6-87 at 1490 kW) based on the technologies and design approaches used in the highly advanced engine of a study of advanced general aviation rotary engines. The data covers the size range of shaft power from 597 kW (800 hp) to 1865 kW (2500 hp) and is in the form of drawings, tables, curves and written text. These include data on internal geometry and configuration, installation information, turbocharging and turbocompounding arrangements, design features and technologies, engine cooling, fuels, scaling for weight size BSFC and heat rejection for varying horsepower, engine operating and performance data, and TBO and maintenance requirements. The basic combustion system was developed and demonstrated; however the projected power densities and performance efficiencies require increases in engine internal pressures, thermal loading, and rotative speed. S.L.

**N83-17546*#** Pratt and Whitney Aircraft Group, West Palm Beach, Fla. Government Products Div.
**FLIGHT EVALUATION OF AN ENGINE STATIC PRESSURE NOSEPROBE IN AN F-15 AIRPLANE Final Report**
C. H. Foote and R. F. Jaekel 15 Aug. 1981 21 p
(Contract NAS4-2703)
(NASA-CR-163109; NAS 1.26:163109; FR-14915) Avail: NTIS HC A02/MF A01 CSCL 21E

The flight testing of an inlet static pressure probe and instrumented inlet case produced results consistent with sea-level and altitude stand testing. The F-15 fliight test verified the basic relationship of total to static pressure ratio versus corrected airflow and automatic distortion downmatch with the engine pressure ratio control mode. Additionally, the backup control inlet case statics demonstrated sufficient accuracy for backup control fuel flow

scheduling, and the station 6 manifolded production probe was in agreement with the flight test station 6 tota pressure probes.
Author

**N83-17547*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
**AERODYNAMIC EFFECT OF A HONEYCOMB ROTOR TIP SHROUD ON A 50.8-CENTIMETER-TIP-DIAMETER CORE TURBINE**
Thomas P. Moffitt and Warren J. Whitney Jan. 1983 19 p refs (NASA-TP-2112; E-1261; NAS 1.60:2112) Avail: NTIS HC A02/MF A01 CSCL 21E

A 50.8-cm-tip-diameter turbine equipped with a rotor tip shroud of hexagonal cell (or honeycomb) cross section has been tested in warm air (416 K) for a range of shroud coolant to primary flow rates. Test results were also obtained for the same turbine operated with a solid shroud for comparison. The results showed that the combined effect of the honeycomb shroud and the coolant flow was to cause a reduction of 2.8 points in efficiency at design speed, pressure ratio, and coolant flow rate. With the coolant system inactivated, the honeycomb shroud caused a decrease in efficiency of 2.3 points. These results and those obtained from a small reference turbine indicate that the dominant factor governing honeycomb tip shroud loss is the ratio of honeycomb depth to blade span. The loss results of the two shrouds could be correlated on this basis. The same honeycomb and coolant effects are expected to occur for the hot (2200 K) version of this turbine.
Author

**N83-17548#** Roskilde Univ. (Denmark).
**DEVELOPMENT OF HIGH TEMPERATURE RESISTANT NON-CORRODIBLE SILICON-CARBIDE COMPONENTS FOR GAS TURBINE APPLICATION Final Report, Apr. 1980**
Stefan R. Schindler and Axel Krauth Bonn Bundesministerium fuer Forschung und Technologie Oct. 1982 59 p In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-82-178; ISSN-0340-7608) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 12,50

Ceramic materials for automobile gas turbines were investigated. The improvement of different silicon carbide materials and suitable production techniques fo the production of static gas turbine components and a heat exchanger was emphasized. Improved material data from test specimens to structural components were obtained by tight connection of production techniques, construction and testing in simulated application conditions. Prototypes of combustion chambers, stators and heat exchangers are tested.
E.A.K.

**N83-17549#** Naval Postgraduate School, Monterey, Calif.
**AN INVESTIGATION OF THE EFFECTIVENESS OF SMOKE SUPPRESSANT FUEL ADDITIVES FOR TURBOJET APPLICATIONS Final Report**
John R. Bramer and David W. Netzer Sep. 1982 71 p refs (AD-A121228; NPS67-82-13) Avail: NTIS HC A04/MF A01 CSCL 21/5

Seven fuel additives were tested to investigate their effectiveness at reducing exhaust stack gas opacity in a turbojet test cell. Exhaust particle sizes and mass concentrations were determined at the engine and stack exhausts using measurements of light transmittance at three frequencies. Particle samples were also collected at the engine exhaust and measured with a scanning electron microscope to verify the optical technique. Nitrous oxide emissions were measured at the test cell stack exhaust. Four of the additives tested were found effective at reducing stack exhaust opacity and particulate mass concentration. None of the additives had any measurable effect on particle diameters. No meaningful changes in particle size or mass occurred between the engine and stack exhausts. The optical technique for determining particle size was verified effective using the scanning electron microscope. No additive had any significant effect on nitrous oxide production.
Author (GRA)

**N83-17457#** Neilsen Engineering and Research, Inc., Mountain View, Calif.
**DEVELOPMENT OF A PROCEDURE FOR CALCULATING THE EFFECTS OF AIRFOIL EROSION ON AIRCRAFT ENGINE COMPRESSOR PERFORMANCE**
O. J. McMillan *In* DOE Symp. on Com. Aviation Energy Conserv. Strategies Apr. 1981 p 31-44 refs (For primary document see N83-17455 08-01)
(Contract DE-AC03-79CS-50095)
Avail: NTIS HC A17/MF A01 CSCL 01/2

**N83-17467#** Flow Application Research, Fremont, Calif.
**TURBINE ENGINE FUEL CONSERVATION BY FAN AND COMPRESSOR PROFILE CONTROL**
William B. Roberts and William Rogers (Rogers-Dierks, Inc.) *In* DOE Symp. on Com. Aviation Energy Conserv. Strategies Apr. 1981 p 231-258 (For primary document see N83-17455 08-01)
Avail: NTIS HC A17/MF A01 CSCL 01/2

# 08 AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

**N83-17550*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
**ANALYSIS OF OSCILLATORY MOTION OF A LIGHT AIRPLANE AT HIGH VALUES OF LIFT COEFFICIENT**
James G. Batterson Feb. 1983 51 p refs
(NASA-TM-84563; L-15122; NAS 1.15:84563) Avail: NTIS HC A04/MF A01 CSCL 01C

A modified stepwise regression is applied to flight data from a light research air-plane operating at high angles at attack. The well-known phenomenon referred to as buckling or porpoising is analyzed and modeled using both power series and spline expansions of the aerodynamic force and moment coefficients associated with the longitudinal equations of motion.
Author

**N83-17551*#** Douglas Aircraft Co., Inc., Long Beach, Calif.
**EVALUATION OF LAMINAR FLOW CONTROL SYSTEMS FOR SUBSONIC COMMERCIAL TRANSPORT AIRCRAFT: EXECUTIVE SUMMARY**
W. E. Pearce Dec. 1982 72 p refs
(Contract NAS1-14632)
(NASA-CR-159252; NAS 1.26:159252; ACEE-01-FR-2995) Avail: NTIS HC A04/MF A01 CSCL 01C

An evaluation was made of laminar flow control (LFC) system concepts for subsonic commercial transport aircraft. Configuration design studies, performance analyses, fabrication development, structural testing, wind tunnel testing, and contamination-avoidance techniques were included. As a result of trade studies, a configuration with LFC on the upper wing surface only, utilizing an electron beam-perforated suction surface, and employing a retractable high-lift shield for contamination avoidance, was selected as the most practical LFC system. The LFC aircraft was then compared with an advanced turbulent aircraft designed for the same mission. This comparison indicated significant fuel savings.
Author

**N83-17552*#** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
**MINIMUM-FUEL TURNING CLIMBOUT AND DESCENT GUIDANCE OF TRANSPORT JETS**
F. Neuman and E. Kreindler (Technion - Israel Inst. of Tech.) Jan. 1983 46 p refs
(NASA-TM-84289; A-9067; NAS 1.15:84289) Avail: NTIS HC A03/MF A01 CSCL 01C

The complete flightpath optimization problem for minimum fuel consumption from takeoff to landing including the initial and final turns from and to the runway heading is solved. However, only

the initial and final segments which contain the turns are treated, since the straight-line climbout, cruise, and descent problems have already been solved. The paths are derived by generating fields of extremals, using the necessary conditions of optimal control together with singular arcs and state constraints. Results show that the speed profiles for straight flight and turning flight are essentially identical except for the final horizontal accelerating or decelerating turns. The optimal turns require no abrupt maneuvers, and an approximation of the optimal turns could be easily integrated with present straight-line climb-cruise-descent fuel-optimization algorithms. Climbout at the optimal IAS rather than the 250-knot terminal-area speed limit would save 36 lb of fuel for the 727-100 aircraft. Author

**N83-17553*#** Textron Bell Helicopter, Fort Worth, Tex.
**BENEFITS ASSESSMENT OF ACTIVE CONTROL TECHNOLOGY AND RELATED COCKPIT TECHNOLOGY FOR ROTORCRAFT**
B. J. Hampton 23 Aug. 1982 141 p refs
(NASA-CR-166406; NAS 1.26:166406) Avail: NTIS HC A07/MF A01 CSCL 01C

Two main-rotor active control concepts, one incorporating multicyclic actuators located just below the swashplate, and the other providing for the actuators and power supplies to be located in the rotating frame are considered. Each design concept is integrated with cockpit controllers and displays appropriate to the actuation concept in each case. The benefits of applying the defined ACT/RCT concepts to rotorcraft are quantified by comparison to the baseline model 412 helicopter. These benefits include, in the case of one active control concept; (1) up to 91% reduction in 4/rev hub shears; (2) a flight safety failure rate of 1.96 x 10 to the 8th power failures per flight-hour; (3) rotating controls/rotor hub drag reduction of 40%; (4) a 9% reduction in control system weight; and (5) vibratory deicing. The related cockpit concept reduces pilot workload for critical mission segments as much as 178% visual and 25% manual. A.R.H.

**N83-17554#** National Aerospace Lab., Tokyo (Japan).
**THE ESTIMATION METHOD ON FLUTTER BOUNDARY FROM SUBCRITICAL RANDOM RESPONSES DUE TO AIR TURBULENCES: PROBLEMS OF TEST PROCEDURES AND DATA ANALYSIS**
Yasukatsu Ando, Yuji Matsuzaki, Hiroshi Ejiri, and Takao Kikuchi 1982 19 p refs In JAPANESE; ENGLISH summary
(NAL-TR-718; ISSN-0389-4010) Avail: NTIS HC A02/MF A01

Flutter or divergence boundary from random responses due to turbulences in a flow are estimated. The model and equipment used, and the test procedure are described. The preliminary data processing in which values of the parameters used in the data analysis were selected are emphasized. The effects of the values on the estimation of the aeroelastic characteristics are shown changing them over a wide range. It is very important to use an appropriate combination of the width of the bandpass filter, sampled interval, number of data points, maximum lag of covariance, etc. S.L.

**N83-17555#** Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
**CRITERIA FOR HANDLING QUALITIES OF MILITARY AIRCRAFT**
Robert J. Woodcock (AFWAL, Wright-Patterson AFB, Ohio) Oct. 1982 22 p refs
(AGARD-AR-186; ISBN-92-835-1437-8) Avail: NTIS HC A02/MF A01

Criteria for handling qualities of military aircraft are discussed. Various aspects of this technology are considered: including equivalent systems, high order flight systems, gain and phase margin as a basis of longitudinal flying qualities, etc. S.L.

**N83-17556*#** Minnesota Univ., Minneapolis. Dept. of Aerospace Engineering and Mechanics.
**EIGENSPACE TECHNIQUES FOR ACTIVE FLUTTER SUPPRESSION Final Report, Oct. 1981 - Dec. 1982**
William L. Garrard and Bradley S. Liebst Dec. 1982 107 p refs (Grant NAG1-217)
(NASA-CR-169858; NAS 1.26:169858) Avail: NTIS HC A06/MF A01 CSCL 01C

Eigenspace (ES) techniques were used to design an active flutter suppression system for the DAST ARW-2 flight test vehicle. The ES controller meets control surface activity specifications and at the flutter test condition provides reduced wing root torsion at the gust test condition, and results in improved flutter boundaries. The ES controller is compared with a controller designed using Linear Quadratic (LQ) techniques. The LQ controller exhibits better phase margins at the flutter condition than does the ES controller but the LQ design requires large feedback gains on actuator states while the ES does not. This results in reduced overall actuator gain for the LQ design. Author

# 09 RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.

For related information see also *14 Ground Support Systems and Facilities (Space).*

**N83-17557** National Physical Lab., Teddington (England). Div. of Radiation Science and Acoustics.
**THE 50 kV FREE AIR CHAMBER (1958 DESIGN). ERRORS IN THE AIR ATTENUATION CORRECTION AND IN THE METROLOGY OF THE APERTURE HOLDER**
A. R. S. Marsh and T. T. Williams Dec. 1980 19 p
(NPL-RS-53; ISSN-0143-7135) Copyright. Avail: Issuing Activity

The 50 kV Primary Standard Free Air Chamber was replaced by a new chamber. In the context of comparing the unit of exposure as realized by the two primary free air chambers it was necessary to reexamine certain dimensions of and corrections to the chamber, and these dimensions and the reworked correction factors are discussed. Recommended revisions are listed. Author

**N83-17558#** Federal Aviation Administration, Atlantic City, N.J. Technical Center.
**EVALUATION OF RETROREFLECTIVE PAVEMENT MARKERS FOR PRECISION AND NONPRECISION RUNWAYS Interim Report, Mar. 1981 - Jun. 1982**
Guy S. Brown Washington Dec. 1982 27 p refs
(FAA Proj. 081-502-520)
(FAA-CT-82-112; FAA-RD-82-83) Avail: NTIS HC A03/MF A01

The purpose of this program was to evaluate the use of retroreflective pavement markers, installed in a configuration duplicating runway centerline and touchdown zone lighting system of a Category 2 runway on Category 1 or Nonprecision Approach runways with edge lighting to determine if these retroreflective markers will enhance nighttime visual guidance to provide increased safety of operations and possible reduction in minimums, particularly under wet runway conditions. Visual contact height with the retroreflective pavement marker systems was not enhanced prior to reaching Minimum Descent Altitude (MDA) or Decision Height (DH) for nonprecision or Category 1 approaches respectively; therefore, this system will not permit the reduction in approach minimums for Category 1 precision or nonprecision approaches. However, the test program demonstrated that the system is effective in improving the safety of operation for final approach, flare and touchdown, landing rollout, and for takeoffs. Particularly under rainy, wet nighttime conditions, the pavement retroreflector significantly enhanced the visual guidance, supplementing that provided by the standard runway edge lights and paint markings which are difficult to see under wet conditions. Author

**N83-17559#** Federal Aviation Administration, Atlantic City, N.J. Technical Center.
**EVALUATION OF SUPPLEMENTAL LIGHTS FOR CAUTION BARS Final Report, Feb. - Sep. 1982**

Larry W. Hackler Washington Dec. 1982 25 p refs
(FAA Proj. 081-502-590)
(FAA-CT-82-119; FAA-RD-82-79) Avail: NTIS HC A02/MF A01

Caution Bars (stop bars or hold bars) are used to identify taxiway hold lines and warn pilots of an approaching runway. Caution Bars are difficult to see when they are covered by snow or sand, or when a high cockpit aircraft is at or close to the caution bars. Under these conditions, supplemental lights (taxi holding position lights) could help. This project was to determine the desired characteristics of horizontal and vertical coverage, intensity, flash rate, and orientation of the supplemental lights. The results indicated that these characteristics were acceptable or desired. The results also indicated that the lights would enhance identification of the taxi holding position. B.W.

**N83-17560*#** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
**THE AERODYNAMIC PERFORMANCE OF SEVERAL FLOW CONTROL DEVICES FOR INTERNAL FLOW SYSTEMS**
William T. Eckert (Army Aviation Research and Technology Labs.), Brian M. Wettlaufer (Sverdrup Technology), and Kenneth W. Mort Dec. 1982 49 p refs Sponsored in part by Army Aviation Research and Development Command
(NASA-TP-1972; A-8816; NAS 1.60:1972;
AVRADCOM-TR-81-A-2) Avail: NTIS HC A03/MF A01 CSCL 14B

An experimental reseach and development program was undertaken to develop and document new flow-control devices for use in the major modifications to the 40 by 80 Foot wind tunnel at Ames Research Center. These devices, which are applicable to other facilities as well, included grid-type and quasi-two-dimensional flow straighteners, louver panels for valving, and turning-vane cascades with net turning angles from 0 deg to 90 deg. The tests were conducted at model scale over a Reynolds number range from 2 x 100,000 to 17 x 100,000, based on chord. The results showed quantitatively the performance benefits of faired, low-blockage, smooth-surface straightener systems, and the advantages of curved turning-vanes with hinge-line gaps sealed and a preferred chord-to-gap ratio between 2.5 and 3.0 for 45 deg or 90 deg turns. Author

**N83-17561#** Fraunhofer-Inst. fuer Informations- und Datenverarbeitung, Karlsruhe (West Germany).
**ADVANCED TRAINING SIMULATOR FOR APPLICATION IN CONTROL ROOMS FOR ENERGY DISTRIBUTION Final Report, Dec. 1981**
Rudi Grimm, Werner Neussel, and Wolfgang Ritter Bonn Bundesministerium fuer Forschung und Technologie Sep. 1982 153 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-82-172; ISSN-0340-7608) Avail: NTIS HC A08/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 32

A low cost training simulator which is flexible in relation to the process models and the man machine interface is described. Its structure is modular, containing a computer driven input output color screen system (EAF) as control panel, a process simulator and an instructor interface. A special variation for training operators in the control of energy distribution nets is described. Possibilities and different kinds of training are presented as well as the language for the description of the process, its simulation and the command language for the instructor. The structure of the programs and data of the training simulator as well as the net for the pilot implementation are described. E.A.K.

**N83-17562#** Technische Hochschule, Aachen (West Germany). Verkehrswissenschaftlichen Inst.
**AIDS TO DECISION MAKING IN AIRPORT PLANNING**
Peter Wolf Dec. 1981 249 p refs In GERMAN; ENGLISH summary
(Rept-34) Avail: NTIS HC A11/MF A01

A computer model designed to serve as an aid to decision-making in operational planning and control of new passenger terminals is described. The methodological procedure, the bases for programming, and the testing of the plausibility of the computer model are described. Applications of the computer simulation procedure are outlined including the effects of various parameter alterations. These parameters include: flight plan and load factor of aircraft based on the use of larger aircraft types; passenger processing procedures based on the processing of all passengers by one processing company; and passengers' behavior on arrival at the terminal in cases where check-in time is brought forward owing to stricter security checks. The effects of these parameters on waiting time for passengers and baggage and utilization of the most important terminal areas and the apron are addressed in relation to the processing procedures involved and the personnel strength available for processing. The effects of parameter alterations are shown and discussed for several examples. J.M.S.

# 12 ASTRONAUTICS (GENERAL)

For extraterrestrial exploration see *91 Lunar and Planetary Exploration.*

**N83-17563#** Technische Universitaet, Munich (West Germany). Inst. fuer Luft und Raumfahrt.
**APPLYING SPACE FLIGHT TECHNOLOGY AT UNIVERSITIES Final Report, Jul. 1981**
Eduard Igenbergs Bonn Bundesministerium fuer Forschung und Technologie Sep. 1982 78 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-W-82-019; ISSN-0170-1339) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 16,50

Universities conduct experimental investigations which are rather simple concerning their configuration and space flight requirements. A continuous program which is self supporting and in agreement with the utilization program of the BMFT and independent from the budget of the BMFT is assessed. Astronautical Institutes can support other faculties and are especially helpful to groups which have no contact with astronautics. The development of a university operated information system where the astronautical institutes act as information and support centers for other faculties is assessed. In the framework of practical tests of the suggested approach experiments were proposed for the Spacelab, the LDEF and the GETAWAY SPECIAL. E.A.K.

**N83-17564#** Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
**[ACTIVITIES REPORT OF THE FRENCH AEROSPACE AND RESEARCH INDUSTRY] Annual Report, 1981**
24 May 1982 246 p refs Transl. into ENGLISH from original FRENCH Original contains color illustrations
Avail: NTIS HC A11/MF A01

The solution of the difficult and varied problems raised by aircraft and spacecraft design involves multiple disciplines and techniques, some of which lie outside the traditional aerospace area (data processing, solid state physics, coherent optics). The activities in the fields of physics, structures, aerodynamics, materials, systems, computer science and energetics are reported. S.L.

**N83-17565#** Deutsche Forschungsgemeinschaft, Bad Godesberg (West Germany).
**SPACE RESEARCH IN THE FEDERAL REPUBLIC OF GERMANY, 1981**
1981 74 p refs Presented at COSPAR meeting
Avail: NTIS HC A04/MF A01

Space research programs are summarized. These programs include astronomy, meteorology, ionospheric physics, the magnetosphere, solar radiation and the solar wind, the solar system, etc. International cooperative programs are discussed. Balloon,

laboratory, ground truth, and theoretical work activities are included. S.L.

**N83-17566#** RAND Corp., Santa Monica, Calif.
**SPACE: A SANCTUARY, THE HIGH GROUND OR A MILITARY MISSION**
Joseph E. Justin Apr. 1982 27 p refs
(AD-A121224; RAND/P-6758) Avail: NTIS HC A03/MF A01 CSCL 22/1

This paper discusses military strategy for space and how this strategy should be reflected in our decisions concerning the Soviet threat, the role of the military in space, the Shuttle, military space programs, arms control negotiations for space, and military space organizations. Three general schools of thought are examined: space as a demilitarized sanctuary, space as the high ground for terrestrial force enhancement, and space as a unique military mission. This paper recommends that we should be wary of one-sided arguments. The United States needs a mixed fleet of launchers, a balanced military space programs, a goal of negotjating a realistic arms reduction agreement for space, and a major change in our military space organizations. Space should be viewed as a major military consideration requiring a major national commitment. Author (GRA)

**N83-18202#** Joint Publications Research Service, Arlington, Va.
**THE EARLY STAGE OF DEVELOPMENT OF COSMONAUTICS IN THE USSR (1917-1945)**
Ye. P. Tolmachev *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 6, Nov. - Dec. 1982 (JPRS-82654) 17 Jan. 1983 p 5-17 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 16, no. 6, Nov. - Dec. 1982 p 7-15 (For primary document see N83-18200 08-51)
Avail: NTIS HC A08/MF A01

# 13 ASTRODYNAMICS

Includes powered and free-flight trajectories; and orbit and launching dynamics.

**N83-17567#** Aerospace Corp., El Segundo, Calif. Chemistry and Physics Lab.
**ATMOSPHERIC EFFECTS IN LOW EARTH ORBIT AND THE DMSP ESA OFFSET ANOMALY**
Graham S. Arnold, Ronald R. Herm, and Daniel R. Peplinski 30 Sep. 1982 63 p refs
(Contract F04701-81-C-0082)
(AD-A121611; TR-0082(2478-20)-1; SD-TR-82-81) Avail: NTIS HC A04/MF A01 CSCL 22/3

A space vehicle in Earth orbit experiences bombardment with fast (about 8 km/sec) atmospheric articles, the principal of which is atomic oxygen, by virtue of its orbital velocity. Several satellite systems that have been or may be adversely affected by atmospheric impact are described. The current knowledge of the gas-surface interactions of atomic oxygen and the available experimental technology for laboratory simulation of atmospheric bombardment in orbit are reviewed. The DMSP EAS offset anomaly is described and evidence for linking this misbehavior to atmospheric oxygen atom impact is presented and discussed. The results of a laboratory experiment to test this link are presented. GRA

# 14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, mobile transporters; and simulators.

For related information see also *09 Research Support Facilities (Air).*

No abstracts in this category.

# 15 LAUNCH VEHICLES AND SPACE VEHICLES

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

**N83-17568*#** National Aeronautics and Space Administration, Washington, D. C.
**RCA-E/DELTA POST LAUNCH REPORT**
James A. Abrahamson 17 Jan. 1983 2 p
(NASA-TM-85205; M-492-206-82-06; NAS 1.15:85205) Avail: NTIS HC A02/MF A01 CSCL 22A

The RCA-E spacecraft launch is summarized. Performance of the three stage Delta launch vehicle was nominal and placed the payload in a transfer orbit as planned. The ABM firing is also summarized. Author

**N83-17569*#** Smithsonian Astrophysical Observatory, Cambridge, Mass.
**THE STUDY OF THE USE OF TETHERS FOR PAYLOAD ORBITAL TRANSFER. CONTINUATION OF INVESTIGATION OF ELECTRODYNAMIC STABILIZATION AND CONTROL OF LONG ORBITING TETHERS Monthly Progress Report, 1 Nov. - 31 Dec. 1982**
Guiseppe Colombo Jan. 1983 42 p refs
(Contract NAS8-33691)
(NASA-CR-170714; NAS 1.26:170714; MPR-19) Avail: NTIS HC A03/MF A01 CSCL 22B

The algorithm used in the reel maneuver was refined so as to develop a workable pre-release maneuver with particular emphasis on accounting for propagation delay and the dynamics of the tether itself in order to release the payload with no loss of tension along the wire. Author

**N83-17570*#** Smithsonian Astrophysical Observatory, Cambridge, Mass.
**STUDY OF TETHERED SATELLITE ACTIVE ATTITUDE CONTROL Interim Report, 1 Mar. - 31 Aug. 1982**
Guiseppe Colombo Oct. 1982 71 p
(Contract NAS8-33691)
(NASA-CR-170721; NAS 1.26:170721) Avail: NTIS HC A04/MF A01 CSCL 22B

Existing software was adapted for the study of tethered subsatellite rotational dynamics, an analytic solution for a stable configuration of a tethered subsatellite was developed, the analytic and numerical integrator (computer) solutions for this 'test case' was compared in a two mass tether model program (DUMBEL), the existing multiple mass tether model (SKYHOOK) was modified to include subsatellite rotational dynamics, the analytic 'test case,' was verified, and the use of the SKYHOOK rotational dynamics capability with a computer run showing the effect of a single off axis thruster on the behavior of the subsatellite was demonstrated. Subroutines for specific attitude control systems are developed and applied to the study of the behavior of the tethered subsatellite under realistic on orbit conditions. The effect of all tether 'inputs,' including pendular oscillations, air drag, and electrodynamic

interactions, on the dynamic behavior of the tether are included. S.L.

**N83-17571*#** National Aeronautics and Space Administration, Washington, D. C.
**NIMBUS-7 (-G) POST LAUNCH REPORT: MISSION SUCCESS**
B. I. Edelson 21 Jan. 1983 19 p
(NASA-TM-85209; Rept-E-604-78-08; NAS 1.15:85209) Avail: NTIS HC A02/MF A01 CSCL 22B

Nimbus-7, the last of the Nimbus series satellites, was launched from the Space and Missile Test Center at Vandenberg Air Force Base, California on October 24, 1978. The purpose of the mission was to collect global data of the Earth's atmosphere, oceans and polar ice with a payload of eight interdisciplinary research experiments. These experiments represent both domestic and international, scientific and governmental communities. Author

**N83-17572*#** National Aeronautics and Space Administration, Washington, D. C.
**TELESAT-G/DELTA POST LAUNCH REPORT**
Joseph B. Mahon and James A. Abrahamson 7 Jan. 1983 4 p
(NASA-TM-85204; M-492-201-82-05; NAS 1.15:85204) Avail: NTIS HC A02/MF A01 CSCL 22B

The Canadiari Telesat-G (ANIK-D1) commercial communications satellite was launched successfully from the Eastern space and Missile Center (ESMC) at 7:10 p.m., EDT, on August 25, 1982, by a Delta 3920 Vehicle, Mission Number 164. Performance of the two stage Delta launch vehicle was nominal and placed the payload in a low circular orbit as planned. The Payload Assist Module (PAM-D), which is part of the payload, also performed nominally. The synchronous transfer orbital elements achieved by Delta/PAM, compared with the nominal expected, are provided. The satellite performed satisfactorily during the transfer orbit, and the ABM was fired successfully at 5:29 p.m., EDT, on August 29, 1982. The satellite was maneuvered to a position 104 degrees West Longitude above the equator. Satellite status is satisfactory and it has entered service. Author

**N83-17573*#** Smithsonian Astrophysical Observatory, Cambridge, Mass.
**STUDY OF CERTAIN TETHER SAFETY ISSUES AND THE USE OF TETHERS FOR PAYLOAD ORBITAL TRANSFER. CONTINUATION OF INVESTIGATION OF ELECTRODYNAMIC STABILIZATION AND CONTROL OF LONG ORBITING TETHERS Semiannual Report, 1 Mar. - 31 Aug. 1981**
Guiseppe Colombo Aug. 1981 28 p refs
(Contract NAS8-33691)
(NASA-CR-170720; NAS 1.26:170720) Avail: NTIS HC A03/MF A01 CSCL 22B

Tether safety issues are summarized. N.W.

**N83-17574** Prins Maurits Lab. TNO, Rijswijk (Netherlands). Inst. voor Chemische en Technologiche Research.
**GENERAL BASIC CONCEPTS FOR A TRAJECTORY SIMULATION OF A GUIDED MISSILE**
P. W. Doup Jul. 1981 51 p refs
(Contract A76/KM/029)
(PML-1981-36; TDCK-76160) Copyright. Avail: Issuing Activity

Basic concepts needed for a flight path simulation of a guided missile were collected. Special attention is given to a missile with variable mass. The dynamic equations of motion are applied to a rigid body structure and the kinematic relationships are restricted to a missile flying over a nonrotating Earth. E.A.K.

**N83-17575#** Army Missile Command, Redstone Arsenal, Ala. Guidance and Control Directorate.
**LANCE Q-FLEX ACCELEROMETER QUALIFICATION TEST PROGRAM**
Joe S. Hunter, James N. Mitchell, Troy Hester, and Donald Searcy 8 Mar. 1982 23 p
(AD-A121264; AD-E950293; DRSMI/RG-82-6-TR) Avail: NTIS HC A02/MF A01 CSCL 14/2

This report covers the performance obtained on six Sundstrand Q-Flex accelerometers during the qualification test program for the LANCE missile. The Qualification Test Program was divided into three parts: (1) Flight Assurance Tests (FAT), (2) Storage and Transportation Tests (SATT), and (3) Reliability Overstress Tests (ROT). All testing was performed in accordance with Vought accelerometer procurement specification 704-166C dated 8 June 1978. Author (GRA)

**N83-17576#** Alabama Univ., Huntsville. School of Science and Engineering.
**SOFTWARE DEVELOPMENT FOR THE ANALYSIS OF IMPROVED HAWK WEAPONS SYSTEM Final Report, Apr. 1981 - Jun. 1982**
Gerald Johnson, Laura Jeziorski, and James Marr Redstone Arsenal, Ala. Army Missile Command Jul. 1982 64 p refs
(Contract DAAH01-81-D-A006)
(AD-A121270; AD-E950310; DRSMI/RD-CR-82-26) Avail: NTIS HC A04/MF A01 CSCL 09/2

The FEASIL data base relational management system is discussed. The current implementation of the FEASIL system for the IHAWK missile project is discussed. The creation and operation of the IHAWK data bases is detailed. Conclusions and recommendations for further development of FEASIL and IHAWK data base systems are presented. Author (GRA)

**N83-17577#** Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Unternehmensbereich Apparate.
**TECHNOLOGY OF COMPONENTS FOR GUIDED MISSILE SYSTEMS (OVERVIEW) [TECHNOLOGIE DER LENKFLUGKOERPERSYSTEMKOMPONENTEN (UEBERLICK)]**
Horst Kaltschmidt 12 Jul. 1982 22 p refs In GERMAN Presented at Kurs F3.06: Systemtech. fuer Lenkflugkoerper, Oberpfaffenhofen, West Germany, 16 Sep. 1982; sponsored by Carl-Cranz-Gesellschaft e.V.
(MBB-UA-649-82-O) Avail: Issuing Activity

The technology of guided missile systems (launching system, missile, and logistics) was reviewed. The components of the missile itself (ignition sensor, driving mechanism, actuator, target-seeking heads, missile computer, mechanical sensors, guidance systems, communication system, and power supply) are depicted. Author (ESA)

# 16 SPACE TRANSPORTATION

Includes passenger and cargo space transportation e.g., shuttle operations; and rescue techniques.

For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation.*

**N83-17578*#** OAO Corp., Hampton, Va.
**SPACE TRANSPORTATION SYSTEM FLIGHT 2 OSTA-1 SCIENTIFIC PAYLOAD DATA MANAGEMENT PLAN: ADDENDUM**
Apr. 1982 54 p refs
(Contract NASw-3358)
(NASA-CR-169827; NAS 1.26:169827; OTA/TR-82/0025) Avail: NTIS HC A04/MF A01 CSCL 22A

Flight events for the OSTA-1 scientific payload on the second flight of the Space Shuttle, STS-2 are described. Data acquisition is summarized. A discussion of problems encountered and a preliminary evaluation of data quality is also provided. Author

# 17 SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications.*

**N83-17579*#** Jet Propulsion Lab., California Inst. of Tech., Pasadena.

**THE DEEP SPACE NETWORK. AN INSTRUMENT FOR RADIO NAVIGATION OF DEEP SPACE PROBES**
N. A. Renzetti, J. F. Jordan, A. L. Berman, J. A. Wackley, and T. P. Yunck 15 Dec. 1982 105 p refs
(NASA-CR-169884; JPL-Pub-82-102; NAS 1.26:169884) Avail: NTIS HC A06/MF A01 CSCL 22A

The Deep Space Network (DSN) network configurations used to generate the navigation observables and the basic process of deep space spacecraft navigation, from data generation through flight path determination and correction are described. Special emphasis is placed on the DSN Systems which generate the navigation data: the DSN Tracking and VLBI Systems. In addition, auxiliary navigational support functions are described. Author

**N83-17580#** National Aerospace Lab., Amsterdam (Netherlands). Informatics Div.
**TECHNICAL ASSISTANCE TELEMETRY CHANNEL CODING INVESTIGATION. PHASE 2 REPORT: THE REED-SOLOMON OUTER CODING SCHEME**
M. R. Best and H. F. A. Roefs 18 Feb. 1981 60 p refs
(Contracts ESTEC-4184/79/NL-HP; NIVR-1911)
(NLR-TR-81025-U) Avail: NTIS HC A04/MF A01

The phase 2 effort by the National Aerospace Laboratory in the realization of an effective outer coding scheme for use on spacecraft to ground telemetry links is decribed. The phase 2 effort encompasses: a performance test of the Reed-Solomon code when applied to actual recordings of the inner (Viterbi) decoder output data; the specification in detail of the algorithms used in the Reed-Solomon encoder and decoder; and a concept for the hardware implementation of the (spaceborne) encoder. ESA

**N83-17581#** National Aerospace Lab., Amsterdam (Netherlands). Informatics Div.
**TECHNICAL ASSISTANCE TELEMETRY CHANNEL CODING INVESTIGATION Final Report**
M. R. Best and H. F. A. Roefs 15 Sep. 1981 9 p Previously announced as N82-30327
(Contracts ESTEC-4184/79/NL-HP; NIVR-1911)
(NCR-TR-81044-U) Avail: NTIS HC A02/MF A01

The feasibility of an outer coding scheme for use on spacecraft to ground telemetry channels was analyzed. Possible outer coding schemes, taking into account the achievable performance, the encoder/decoder complexity and the compatibility with operational requirements of the European Space Agency (ESA) were studied. A concept for the hardware implementation of the Reed-Solomon encoder is presented and the algorithms to be used in the Reed-Solomon decoder are specified. The Fermat Number Transform for computing the syndrome values and error locations, and an algorithm for solving the key equation to determine both error locator and error evaluator polynomial is outlined. E.A.K.

**N83-17582#** Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Information und Dokumentation.
**THE USE OF TELEMETRY IN TESTING IN HIGH PERFORMANCE RACING ENGINES [EINSATZ VON TELEMETRIE BEI DER ERPROBUNG VON HOCHLEISTUNGSMOTOREN IM RENNSPORT]**
Eberhard Hauser 1982 16 p In GERMAN Presented at Telemetriekonferenz, Garmisch-Partenkirchen, West Germany, 11-15 May, 1982
(MBB-UA-653-82-O) Avail: Issuing Activity

Telemetry measurement data in mobile application and under difficult environmental conditions were recorded. All relevant racing car and engine parameters were measured: pressure, stress, temperature, acceleration, ignition, number of revolutions, control of electronic injection, and flow measurements on the car body. The difficult measuring conditions due to high voltage ignition, mechanical loads and vibrations impose special requirements on a telemetry system built in racing cars. It has to be compact, flexible, light, and mechanically robust and has to fulfil special sheilding conditions. The measured data are transfered to a stationary measurement car via a radio line, involving RF communication problems. The measured data are directly displayed and evaluated in the measurement car. Author (ESA)

# 18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support.* For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics.*

**N83-17583*#** Old Dominion Univ., Norfolk, Va. Dept. of Mechanical Engineering and Mechanics.
**FUNDAMENTAL STUDIES OF HEAT LOAD AND THERMAL-STRUCTURE ANALYSIS OF LARGE SPACE STRUCTURES Progress Report, 16 May 1982 - 31 Jan. 1983**
Earl A. Thornton Feb. 1983 4 p
(Grant NAG1-257)
(NASA-CR-169885; NAS 1.26:169885) Avail: NTIS HC A02/MF A01 CSCL 22B

Investigation of the basic requirements for modeling slender member shadowing effects on thermally induced deformation continues. The theoretical formulation is complete and computer programming is underway. The basic requirements for thermal finite elements to model heat transfer in orbiting structures were also studied. The need for planar isothermal elements to model large space structures' antenna meshes was established. Finite Element approaches for modeling space structure cable and membrane components with thermal effects is underway. Three levels of structural modeling and analysis were identified: (1) a linear-elastic small deflection analysis that does not permit cable slackening; (2) a linear-elastic analysis that includes stress stiffening (the ANSYS program), but not large deflections; and (3) full nonlinear large deflection analysis with stress stiffening. Methods of determining cable initial tensions are currently being evaluated. A.R.H.

# 19 SPACECRAFT INSTRUMENTATION

For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography.*

No abstracts in this category.

# 20 SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components e.g., rocket engines; and spacecraft auxiliary power sources.

For related information see also *07 Aircraft Propulsion, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

**N83-17584#** National Aerospace Lab., Tokyo (Japan).
**SUCTION PERFORMANCE OF LOX/LH2 INDUCERS FOR A ROCKET ENGINE**
Hitoshi Yamada, Kenjiro Kamijyo, Mitsuo Watanabe, and Kunio Hirata 1982 27 p refs In JAPANESE; ENGLISH summary
Avail: NTIS HC A03/MF A01

In the past the prediction of the net positive suction head (NPSH) of the inducer operating in cryogenic propellants, such as liquid hydrogen, liquid oxygen and so on has often been investi-

gated. However, little research has been done on the prediction of NPSH of inducers between different cryogenic liquids or different pump sizes. The present study deals with these problems. Two different inducers, one for liquid hydrogen, and the other for liquid oxygen, were tested in liquid nitrogen and another inducer was tested in liquid hydrogen for various rotative speeds, flow coefficients, and liquid temperatures. NPSH was measured for these three inducers for various flow conditions. The thermodynamic effect of cavitation of liquid hydrogen and liquid nitrogen was compared. The measured values of NPSH in liquid hydrogen tests were in reasonable agreement with those predicted by using test data of liquid nitrogen. B.W.

**N83-17585#** National Aerospace Lab., Tokyo (Japan).
**SEAL PERFORMANCE AND DURABILITY OF ROTATING SHAFT SEALS OF LIQUID OXYGEN TURBOPUMP**
Mineo Suzuki, Kenjiro Kamiyo, Yoshiaki Watanabe, and Massahiro Mori 1982 31 p refs In JAPANESE; ENGLISH summary
(NAL-TR-716; ISSN-0389-4010) Avail: NTIS HC A03/MF A01

A study of the LOX turbopump rotating shaft seals was performed in connection with the research and development of the LOX turbopump. The seal performance and durability of the rotating shaft seals of the LOX turbopump are described. The shaft seal system of the LOX turbopump consists of a liquid oxygen seal (a face-contact metal bellows mechanical seal), a turbine-drive hot gas seal (a segmented hydrodynamic circumferential seal), and a helium purge-gas seal (a double segmented hydrodynamic circumferential seal). The operating conditions are as follows; rotating speed is 16,500 rpm, and sealed fluid pressures and temperatures are 15 ata and 90 K for the mechanical seal, 3 ata and 700 K for the turbine-drive hot gas seal, and 3 ata and ambient for the helium purge-gas respectively. The performance of the LOX turbopump shaft seal system was satisfactory in a series of LOX turbopump and LOX/LH2 turbopump system tests. The wear amount of the seals after total test time of about 2,000 sec. was acceptable. Author

**N83-17586*#** Hughes Research Labs., Malibu, Calif.
**THE 8-CM ION THRUSTER CHARACTERIZATION Final Report, 8 Aug. 1980 - 9 Oct. 1981**
F. J. Wessel and W. S. Williamson Jan. 1983 52 p refs
(Contract NAS3-22447)
(NASA-CR-167887; NAS 1.26:167887) Avail: NTIS HC A04/MF A01 CSCL 21C

The performance capabilities of the 8 cm diameter mercury ion thruster were increased by modifying the thruster operating parameters and component hardware. The initial performance levels, representative of the Hughes/NASA Lewis Research Center Ion Auxiliary Propulsion Subsystem (IAPS) thruster, were raised from the baseline values of thrust, T = 5 mN, and specific impulse, I sub sp = 2,900s, to thrust, T = 25 mN and specific impulse, I sub sp = 4,300 s. Performance characteristics including estmates of the erosion rates of various component surfaces are presented. Author

**N83-17587*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
**OPERATION OF THE J-SERIES THRUSTER USING INERT GAS**
Vincent K. Rawlin 1982 17 p refs Presented at the 16th Intern. Elec. Propulsion Conf., New Orleans, 17-19 Nov. 1982; sponsored by AIAA, Japan Soc. for Aeronautical and Space Sciences, and DGLR
(NASA-TM-82977; E-1406; NAS 1.15:82977; AIAA-Paper-82-1929) Avail: NTIS HC A02/MF A01 CSCL 21H

Electron bombardment ion thrusters using inert gases are candidates for large space systems. The J-Series 30 cm diameter thruster, designed for operation up to 3 k-W with mercury, is at a state of technology readiness. The characteristics of operation with xenon, krypton, and argon propellants in a J-Series thruster with that obtained with mercury are compared. The performance of the discharge chamber, ion optics, and neutralizer and the overall efficiency as functions of input power and specific impulse and thruster lifetime were evaluated. As expected, the discharge chamber performance with inert gases decreased with decreasing atomic mass. Aspects of the J-Series thruster design which would require modification to provide operation at high power with insert gases were identified. A.R.H.

**N83-17588*#** National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
**METHOD AND APPARATUS FOR SUPPRESSING IGNITION OVERPRESSURE IN SOLID ROCKET PROPULSION SYSTEMS Patent Application**
Stanley H. Guest and Jess H. Jones, inventors (to NASA) Filed 24 Nov. 1982 15 p
(NASA-Case-MFS-25843-1; US-Patent-Appl-SN-444125) Avail: NTIS HC A02/MF A01 CSCL 21H

The transient overpressure wave produced upon ignition of a solid rocket booster is suppressed by providing within the launch platform, a plurality of pipes and spray heads disposed around the periphery of the exhaust gas plume near its upper end and spraying water into the upper end of the plume during ignition. A large amount of water, preferably equivalent in mass of exhaust products being ejected, is sprayed into the plume in a direction generally perpendicular to plume flow. NASA

**N83-17589#** Research Inst. of National Defence, Linkoeping (Sweden).
**MILLIMETER WAVELENGTH EMISSION FROM SOLID PROPELLANT ROCKET MOTOR PLUMES**
Ain Sume Sep. 1982 32 p refs
(FOA-C-30291-E1-E3) Avail: NTIS HC A03/MF A01

Various physical mechanisms for the thermal emission at millimeter wavelengths (1 cm to 1 mm) from plumes of solid propellant rocket motors are investigated with the help of published results from detailed calculations of plume conditions. It is found that most probably the well-known free-free emission caused by the collisions between free electrons and molecules in the plume is dominant in the whole wavelength region. The emission from solid Al2O3 particles is difficult to estimate due to lack of data of their properties at the relevant frequencies and conditions. It may become significant at the higher frequencies, but probably it is still at least one order of magnitude weaker. The emissions from molecular spectral lines of CO and H2O, and atomic recombination lines are probably orders of magnitude weaker. R.J.F.

## 23 CHEMISTRY AND MATERIALS (GENERAL)

Includes biochemistry and organic chemistry.

**N83-17590*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
**ETHYNYL AND SUBSTITUTED ETHYNYL-TERMINATED POLYSULFONES Patent Application**
Paul M. Hergenrother, inventor (to NASA) Filed 8 Oct. 1982 20 p
(NASA-Case-LAR-12931-1; US-Patent-Appl-SN-433598) Avail: NTIS HC A02/MF A01 CSCL 07C

Ethynyl and substituted ethynyl terminated polysulfones and a process for preparing the same are disclosed. These polysulfones are thermally cured to induce crosslinking and chain extension, producing a polymer system with improved solvent resistance and use temperatures. Substituted 4-ethynylbenzoyl chlorides are disclosed as precursors to the substituted ethynl terminated polysulfones and a process for preparing the same. NASA

**N83-17591#** Internationale Dokumentationsgesellschaft fuer Chemie m.b.H., Frankfurt am Main (West Germany). Datenverarbeitung und Entwicklung.
**CRT DISPLAY OF CHEMICAL STRUCTURES BY GENERATING THEM FROM TOPOLOGICAL DATA Final Report, Sep. 1981**
Dieter Schumacher Bonn Bundesministerium fuer Forschung und

Technologie Oct. 1982 96 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-ID-82-002; ISSN-0170-8996) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 20

Executing searches in files of chemical information is easier and faster by using the online screen output of structure formulas. The mechanical generation of the formula is usually achieved by evaluating the topological data. With the help of theoretical graphic means the relative coordinates are calculated, after reducing the structure to cyclical (rings) and acyclical (chains and bridges) constituent parts; or after topological identification the more complicated rings systems are taken from a reserve file. A multistep process unites the single parts to a complete structure with absolute coordinates. The process of generation is supported by means of area partition, perception of surroundings and drawing without overlappings and crossing lines. Author

**N83-17592#** Minnesota Univ., Minneapolis.
**THE CONTRIBUTION OF ELECTRONICALLY EXCITED STATES TO THE RADIATION CHEMISTRY OF ORGANIC SYSTEMS Progress Report, 1 Sep. 1980 - 30 Nov. 1981**
Sanford Lipsky 1981 12 p
(Contract DE-AS02-78ER-00913)
(DE82-004906; DOE/ER-00913/2) Avail: NTIS HC A02/MF A01

The effect of a perfluorocarbon to quench the photoionization current of N,N,N',N'-tetramethyl-p-phenylenediamine (TMPD) in a non-polar liquid was studied as a function of temperature, excitation energy, and the nature and composition of the solution. A model is developed to explain the results on the basis of an interaction of the quencher with an epithermal electron. Contact charge transfer bands involving saturated hydrocarbons and perfluorocycloalkanes were discovered. Similar bands are not observed for hydrocarbon contact with perfluoro-n-alkanes. Also, perfluorocycloalkanes are found to have very strong quenching effecton saturated hydrocarbon fluorescence. Analysis of the quenching behavior indicates unusually large (14 A) encounter radii for this quenching interaction. A long-range charge transfer appears to be implicated. The fluorescence quantum yield of liquid cyclohexane was determined for excitation wavelengths from 165 nm to 178 nm. The ratio of excimer to monomer fluorescence of dilute solutions of polystyrene in various solvents was observed to increase with increasing polymer molecular weight and decreasing thermodynamic quality of the solvent. DOE

**N83-17593#** Massachusetts Inst. of Tech., Cambridge. Energy Lab.
**THERMAL REACTIONS OF AROMATICS WITH CaO Technical Progress Report, 1 May - 31 Aug. 1981**
John P. Longwell, Stephen Krasniak, Stephen Chiu K. Lai, Glenn C. Williams, and William A. Peters Nov. 1981 11 p refs
(Contract DE-FG22-80PC-30229)
(DE82-011497; DOE/PC-30229/2) Avail: NTIS HC A02/MF A01

Pyrolysis experiments with 5 mole % CH4 in helium were performed in a CaO packed bed between 600 C and 950 C so as to investigate the possibility of secondary cracking of CH4 under these reaction conditions. The data suggest that the initiation of CH4 cracking over CaO occurs at about 700 C yielding coke and small amounts of CO, C2H4 and C2H6. Hydrogen was likely to be one of the products but no attempt was made to analyze its presence in the off gas. Over the temperature range in which the pyrolysis of two methylsubstituted aromatics was carried out (between 500 C and 800 C), the conversion of CH4 was less than 20% and thus inadequate to justify the theory of secondary cracking completely. To account for the CH4 phenomenon, it is concluded that the mechanism for the pyrolysis of the two aromatics over CaO is different from that over quartz. DOE

# 24 COMPOSITE MATERIALS

Includes laminates.

**N83-17594** Defence Research Information Centre, Orpington (England).
**THE IN-PLANE SHEAR PROPERTIES OF CFRP/ALUMINUM HONEYCOMB SANDWICH PANELS**
Yoshio Noguchi and Toshiyasu Furuta Sep. 1982 32 p refs Transl. into ENGLISH from Jap. Natl. Aerospace Lab. Tech. Rept. TR-621, July 1980 11 p
(DRIC-T-6628; BR85018) Copyright. Avail: Issuing Activity

The results are presented of an investigation of in plane shear properties in similarly constituted carbon fiber reinforced plastic (CFRP)/aluminum honeycomb sandwich panels with bias laminated and cross laminated face members. The fracture strength and fracture modes were measured on specimens with 25, 0, 90, -25 deg and 43, 0, 90 and -45 deg laminated face members. Holographic interference techniques were used to inspect the delamination in the CFRP laminate and laminate honeycomb core interfaces. Serious defects in the sandwich panels were detected. Author

**N83-17595#** National Aerospace Lab., Tokyo (Japan).
**STRENGTH EVALUATION TEST OF PRESSURELESS-SINTERED SILICON NITRIDE AT ROOM TEMPERATURE**
Katsutoshi Matsusue, Kitao Takahara, and Ryosaku Hashimoto Jun. 1982 12 p refs In JAPANESE; ENGLISH summary
(NAL-TR-715; ISSN-0389-4010) Avail: NTIS HC A02/MF A01

In order to study strength characteristics at room temperature and the strength evaluating method of ceramic materials, the following tests were conducted on pressureless sintered silicon nitride specimens: bending tests, the three tensile tests of rectangular plates, holed plates, and notched plates, and spin tests of centrally holed disks. The relationship between the mean strength of specimens and the effective volume of specimens was examined using Weibull's theory. The effect of surface grinding on the strength of specimens was discussed. Author

**N83-17596*#** Wyoming Univ., Laramie. Composite Materials Research Group.
**STIFFNESS REDUCTIONS DURING TENSILE FATIGUE TESTING OF GRAPHITE/EPOXY ANGLE-PLY LAMINATES Final Report**
Edwin M. Odom and Donald F. Adams Nov. 1982 182 p refs
(Contract NAS1-16557)
(NASA-CR-166019; ; NAS 1.26:166019; UWME-DR-201-105-1) Avail: NTIS HC A09/MF A01 CSCL 11D

Tensile fatigue data was generated under carefully controlled test conditions. A computerized data acquisition system was used to permit the measurement of dynamic modulus without interrupting the fatigue cycling. Two different 8-ply laminate configurations, viz, [ + or - 45 ] (2s) and [ + or - 67.5 ] (2s), of a T300/5208 graphite/epoxy composite were tested. The [ + or - 45 ] (2s) laminate did exhibit some modulus decay, although there was no well-defined correlation with applied stress level or number of cycles. The [ + or - 67.5 ] (2s) laminate did not exhibit any measurable modulus decay. Secondary effects observed included a small but distinct difference between modulus as measured statically and dynamically, a slight recovery of the modulus decay after a test interruption, and a significant viscoelastic (creep) response of the [ + or - 45 ] (2s) laminate during fatigue testing. A.R.H.

**N83-17597*#** Rensselaer Polytechnic Inst., Troy, N. Y. School of Engineering.
**COMPOSITE STRUCTURAL MATERIALS Semiannual Progress Report, 30 Apr. - 30 Sep. 1982**
George S. Ansell, Robert G. Loewy, and Stephen E. Wiberley Dec. 1982 167 p refs
(Grant NGL-33-018-003)
(NASA-CR-169859; NAS 1.26:169859; SAR-43) Avail: NTIS HC A08/MF A01 CSCL 11D

The promise of filamentary composite materials, whose development may be considered as entering its second generation, continues to generate intense interest and applications activity. Fiber reinforced composite materials offer substantially improved performance and potentially lower costs for aerospace hardware. Much progress has been achieved since the initial developments in the mid 1960's. Rather limited applications to primary aircraft structure have been made, however, mainly in a material-substitution mode on military aircraft, except for a few experiments currently underway on large passenger airplanes in commercial operation. To fulfill the promise of composite materials completely requires a strong technology base. NASA and AFOSR recognize the present state of the art to be such that to fully exploit composites in sophisticated aerospace structures, the technology base must be improved. This, in turn, calls for expanding fundamental knowledge and the means by which it can be successfully applied in design and manufacture. L.F.M.

**N83-17598*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

**MIXED-MODE STRAIN-ENERGY-RELEASE RATE EFFECTS ON EDGE DELAMINATION OF COMPOSITES**

T. Kevin OBrien Jan. 1983 39 p refs Presented at the ASTM Symp. on Effects of Defects in Composite Mater., San Francisco, 13-14 Dec. 1982

(NASA-TM-84592; NAS 1.15:84592) Avail: NTIS HC A03/MF A01 CSCL 11D

Unnotched graphite/epoxy laminates, designed to delaminate at the edges under static and cyclic tensile loads, were tested and analyzed. The specimen stacking sequences were chosen so that the total strain-energy-release rate, G, for edge delamination was identical for all three layups. However, each layup had different percentages of crack-opening and shear-mode strain-energy-release rates, G sub 1 and G sub 2, respectively. Results with composites made from T300 graphite fibers and 5208 epoxy, a brittle resin, indicated that only G sub 1 contributed to delamination onset under static loading. However, results with composites made from C6000 fibers and H205 epoxy, a tougher resin, indicated that the total F governed the onset of edge delaminations under cyclic loads. In addition, for both materials, the threshold level of G for delamination onset in fatigue was significantly less than the critical G sub c measured in static tests. Futhermore, although the C6000/H205 material had a much higher static G sub c than T300/5208, its fatigue resistance was only slightly better. A series of mixed-mode tests, like the ones in this study, may be needed to evaluate toughened-resin composites developed for highly strained composite structures subjected to cyclic loads. Author

**N83-17599*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

**STRAIN ENERGY RELEASE RATE ANALYSIS OF CYCLIC DELAMINATION GROWTH IN COMPRESSIVELY LOADED LAMINATES**

John D. Whitcomb Jan. 1983 39 p refs Presented at the ASTM Symp. on the Effects of Defects in Composite Mater., San Francisco, 13-14 Dec. 1982

(NASA-TM-84598; NAS 1.15:84598) Avail: NTIS HC A03/MF A01 CSCL 11D

Delamination growth in compressively loaded composite laminates was studied analytically and experimentally. The configuration used was a laminate with an across-the-width delamination. An approximate super-position stress analysis was developed to quantify the effects of various geometric, material, and load parameters on mode 2 and mode 2 strain energy release rates G sub/1 and G sub 2, respectively. Calculated values of G sub 1 and G sub 2 were then compared with measured cyclic delamination growth rates to determine the relative importance of G sub 1 and G sub 2. High growth rates were observed only when G sub 1 was large. However, slow growth was observed even when G sub 1 was negligibly small. This growth apparently was due to a large value of G sub 2. Author

**N83-17600*#** Lockheed-Georgia Co., Marietta.

**PROGRAM FOR ESTABLISHING LONG-TIME FLIGHT SERVICE PERFORMANCE OF COMPOSITE MATERIALS IN THE CENTER WING STRUCTURE OF C-130 AIRCRAFT. PHASE 5: FLIGHT SERVICE AND INSPECTION Final Report**

J. A. Kizer Oct. 1981 36 p refs

(Contract NAS1-11100)

(NASA-CR-165770; NAS 1.26:165770; LG81340198) Avail: NTIS HC A03/MF A01 CSCL 11D

Inspections of the C-130 composite-reinforced center wings were conducted over the flight service monitoring period of more than six years. Twelve inspections were conducted on each of the two C-130H airplanes having composite reinforced center wing boxes. Each inspection consisted of visual and ultrasonic inspection of the selective boron-epoxy reinforced center wings which included the inspection of the boron-epoxy laminates and the boron-epoxy reinforcement/aluminum structure adhesive bondlines. During the flight service monitoring period, the two C-130H aircraft accumulated more than 10,000 flight hours and no defects were detected in the inspections over this period. The successful performance of the C-130H aircraft with composite-reinforced center wings allowed the transfer of the responsibilities of inspecting and maintaining these two aircraft to the U. S. Air Force. Author

**N83-17601*#** National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

**PRESTRESSED THERMAL PROTECTION SYSTEMS Patent Application**

Thomas J. Dunn, inventor (to NASA) Filed 15 Sep. 1982 14 p (NASA-Case-MSC-20254-1; US-Patent-Appl-SN-418137) Avail: NTIS HC A02/MF A01 CSCL 11D

An attachment system is disclosed for a thermal protection system formed of overlapping hexagonal advanced carbon carbon (ACC) panels. A framework of adhesively attached spacer bars forms hexagonal pockets. In the center of each pocket there is a mechanically attached stanchion. Low density batt insulation is located in each pocket. Each protective panel has a central hub and a threaded fastener extends through the hub and into threads in the stanchion to draw the panel into contact with the stanchion. An ACC disc covers the top of the fastener to protect it. The installed panels are prestressed in bending, the fasteners in tension, and the spacer bars in compression so that the edges of the panels remain in firm contact with the overlapped lips of adjacent panels. The thickness, size and precurvature of the panels are sized so that the forces generated on lift off will not overcome the preload. The hexagonal planform of the panels provide a large ratio of area to circumference and provides a smooth array without long extending straight lines. NASA

**N83-17602*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

**SHELL TILE THERMAL PROTECTION SYSTEM Patent Application**

Ian O. MacConochie, Ashby G. Lawson, and H. Neale Kelly, inventors (to NASA) Filed 20 Oct. 1982 21 p

(NASA-Case-LAR-12862-1; US-Patent-Appl-SN-435511) Avail: NTIS HC A02/MF A01 CSCL 11D

A reusable, externally applied thermal protection system for use on aerospace vehicles subject to high thermal and mechanical stresses utilizes a shell tile structure which effectively separates its primary functions as an insulator and load absorber. The tile consists of structurally strong upper and lower metallic shells manufactured from materials meeting the thermal and structural requirements incident to tile placement on the spacecraft. A lightweight, high temperature package of insulation is utilized in the upper shell while a lightweight, low temperature insulation is utilized in the lower shell. Assembly of the tile which is facilitated by a self-looking mechanism, may occur subsequent to installation of the lower shell on the spacecraft structural skin. NASA

**N83-17603*#** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

**FLUOROEOETHER MODIFIED EPOXY COMPOSITES Patent Application**
Robert W. Rosser and Mark S. Taylor, inventors (to NASA) (San Jose State Univ., Calif.) Filed 23 Dec. 1982 17 p
(NASA-Case-ARC-11418-1; US-Patent-Appl-SN-452464) Avail: NTIS HC A02/MF A01 CSCL 11D

A modified epoxy resin composition is diclosed. This resin system comprises conventional epoxy resins and curing agents plus from 1 to 15% by weight of a perfluorinated alkyl ether diacyl fluoride modifier. The modifier is added to the resin before curing. Cured products, made with and without fiber reinforcement, have improved properties. Cured products made the resin systems show decreased water pickup, good thermal stability, improved tensile strength, improved tensile modulus and improved flexural properties. These materials can be processed in conventional epoxy resin equipment and can replace existing epoxy systems in applications where their improved tensile and flexural properties would be of advantage. NASA

**N83-17604#** Aeronautical Research Inst. of Sweden, Stockholm. Structures Dept.
**MECHANICAL DEGRADATION OF CARBON FIBER REINFORCED PLASTICS DUE TO MOISTURE ABSORPTION AT DIFFERENT TEMPERATURES**
Tommy Johansson, T. Linderoth, B. Thoernquist, and B. Wallstenius Aug. 1982 48 p refs
(Contract FMV-F:FL-82223-78-170-21-001)
(FFA-TN-1982-30) Avail: NTIS HC A03/MF A01

Several investigations have shown that the mechanical properties of fiber reinforced plastics (FRP) are negatively affected by moisture, particulary at high temperatures. In the present report the attention is focused towards the mechanical degradation of fiber reinforced plastics due to moisture absorption at different temperatures is studied. Static strength and residual strength after random fatigue loading were measured at different temperatures. The strength tests were performed with a moisture content of 1% (by weight). S.L.

**N83-17605#** National Aerospace Lab., Amsterdam (Netherlands). Structures and Materials Div.
**IMPACT DAMAGE EFFECTS OF FATIGUE OF COMPOSITE MATERIALS**
W. G. J. Thart and R. J. H. Wanhill Mar. 1982 18 p refs Presented at 2nd Intern. SAMPE Conf., Stresa, Italy, 8-10 Jun. 1982 Sponsored by Netherlands Agency for Aerospace Programs (NIVR)
(NLR-MP-82011-U) Avail: NTIS HC A02/MF A01

The effects of low velocity impact damage on tension compression fatigue of composite sandwich panels were investigated. The panels consisted of carbon epoxy face sheets with a 9 mm thick NOMEX honeycomb core. Impact damage was mainly face sheet delamination. Fatigue resulted in propagation of delamination damage, leading to face sheet/core debonding and fiber breakage in some cases. Damage propagation occurred at relatively low fatigue stresses and from barely visible impacts. The methods of damage detection are discussed. E.A.K.

**N83-17606#** Acurex Corp., Mountain View, Calif.
**DISCLINATIONS IN CARBON-CARBON COMPOSITES Annual Report, Jul. 1981 - Jul. 1982**
J. E. Zimmer and R. L. Weitz Sep. 1982 68 p refs
(Contract N00014-81-C-0641)
(AD-A121319; TR-82-24/ATD; AR-1) Avail: NTIS HC A04/MF A01 CSCL 11/4

Disclinations are prominent in the matrix microstructure of carbon-carbon composites and are introduced via the formation of the carbonaceous mesophase, a discotic nematic liquid crystal. The structure-sensitive physical properties of these composites are expected to be related to their microstructure and the disclination structures in this microstructure. The objectives of this research are to identify and classify the disclination structures in the matrix of carbon-carbon composites and to determine the relationship of the disclinations to the fracture behavior of the composite matrix. For arrays of disclinations in the carbonaceous mesophase, neighboring disclinations are of opposite sign and the total strength of an array tends to zero, as shown with the use of optical micrography. The strength S of a disclination is a measure of the amount of rotational distortion (2 Pi S) associated with each disclination. Crack propagation in the carbonaceous mesophase has been studied with the use of optical micrography and a wedge-opening specimen to produce incremental crack growth. The disclinations were shown to control the crack path, and to stop and divert the crack path. This evidence indicates that the disclinations in the carbonaceous mesophase contribute to the high work of fracture of graphitic materials by crack blunting, crack diverting and energy absorption. GRA

**N83-17607#** Sandia Labs., Albuquerque, N. Mex.
**TRANSVERSE COMPRESSIVE STRESS-STRAIN BEHAVIOR OF THICK KEVLAR/EPOXY LAMINATES**
T. R. Guess and R. H. Ericksen 1982 28 p refs Presented at the Symp. on Compression Testing of Homogenous Mater. and Composites, Williamsburg, Va., 10 Mar. 1962
(Contract DE-AC04-76DP-00789)
(DE82-008194; SAND-81-1202C; CONF-820340-1) Avail: NTIS HC A03/MF A01

The room temperature compressive stress-strain response of quasi-isotropic Kevlar 49 fabric/epoxy composites was studied. Cylindrical specimens with porosity up to 20% were loaded normal to the plane of fiber reinforcement. Sample porosity was an important factor affecting the shape of the compressive stress-strain curve, modulus, strength, strain to failure, and Poisson's ratio. As a porous specimen was loaded in compression the tangent modulus first decreased due to void collapse, and then increased as complete consolidation was approached. Increasing the porosity from 1 to 20% caused the initial modulus to decrease, the strength to be reduced, Poisson's ratio to change, and the failure strain to increase. Most of the axially compressed cylindrical specimens failed along inclined planes by shearing through many layers of fabric. Broken fibers were observed on the fracture surfaces. DOE

**N83-17608#** Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Unternehmensbereich Drehfluegler.
**LOW TEMPERATURE CHARACTERISTICS OF HIGHLY STABLE AND HIGHLY MODULAR CARBON FIBER REINFORCED PLASTICS [TIEFTEMPERATUREIGENSCHAFTEN VON HOCHFESTEN UND HOCHMODULIGEN KOHLEFASERVERBUNDEN]**
W. Weiss 26 May 1982 35 p refs In GERMAN Presented at DGLR Symp. on Entwicklung und Anwendung von CFK-Strukt., Stuttgart, 26-27 May 1982
(MBB-UD-357-82-O) Avail: Issuing Activity

The mechanical and thermal properties of carbon fiber reinforced epoxy resins at cryogenic temperatures were tested. The tensile strength of the composite with highly modular fiber is lower than at room temperature, while the tensile swelling strength is a bit higher at cryogenic temperatures. The dilatation is shown since the thermal expansion coefficient is strongly temperature dependent. Heat conductivity decreases considerably at low temperatures. Author (ESA)

**N83-17609#** Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
**PRACTICAL CONSIDERATIONS OF DESIGN, FABRICATION AND TESTS FOR COMPOSITE MATERIALS**
Sep. 1982 198 p refs Lectures held in Oporto, Portugal, 11-12 Oct. 1982, in London, 14-15 Oct. 1982 and in Ankara, 18-19 Oct. 1982
(AGARD-LS-124; ISBN-92-835-1436-X) Avail: NTIS HC A09/MF /01

Fiber composites used as aircraft construction materials are discussed. Emphasis is placed on the mechanical properties of the composites. Failure analysis, structural integrity, fatigue damage, micromechanical models, and structural analysis are discussed. For individual titles, see N83-17610 through N83-17622.

**N83-17610#** Bath Univ. (England). School of Materials Science.
**THE NATURE OF FIBRE COMPOSITE MATERIALS**
Bryan Harris *In* AGARD Pract. Considerations of Design, Fabric. and Tests for Composite Mater. Sep. 1982 5 p refs (For primary document see N83-17609 08-24)
Avail: NTIS HC A09/MF A01

The physical and mechanical characteristics of the practical fiber composites that are most prominently of interest to structural and aeronautical engineers are discussed. Some of their applications in the aerospace field are discussed. Various composite materials are compared in terms of strength. The functions of the matrix are discussed. R.J.F.

**N83-17611#** Ecole Nationale Superieure des Mines, Paris (France). Centre des Materiaux.
**CHARACTERISTICS AND SELECTION OF FIBRES FOR AEROSPACE LAMINATES**
A. R. Bunsell *In* AGARD Pract. Considerations of Design, Fabric. and Tests for Composite Mater. Sep. 1982 11 p refs (For primary document see N83-17609 08-24)
Avail: NTIS HC A09/MF A01

Fiber composites to be used in aircraft construction materials are discussed. The mechanical properties of several composite materials are discussed. The molecular structure of fibers is discussed. The mechanical properties of some composites are compared to various alloys. The role of heat treatment is discussed. R.J.F.

**N83-17612#** Ecole Nationale Superieure des Mines, Paris (France). Centre des Materiaux.
**THE ROLE OF THE MATRIX**
A. R. Bunsell *In* AGARD Pract. Considerations of Design, Fabric. and Tests for Composite Mater. Sep. 1982 10 p refs (For primary document see N83-17609 08-24)
Avail: NTIS HC A09/MF A01

The role of the matrix materials in fiber reinforced composites is discussed. A composite material is composed of fibers enbedded in a matrix. Usually, although not always, the mechanical properties of the fibers are greatly superior to those of the matrix which is usually weaker and more extensible. The role of the matrix is to transfer the load applied to the composite to the fibers and the matrix is rarely expected to support direct tensile loading. Load transfer into and between fibers is assured by shear deformation of the matrix around fibers. If the number of fibers in the composite is too low and the distance between fibers too great reinforcement does not occur. The quality of the adhesion between fiber and matrix plays an important role and the failure of this interface or of the matrix near the interface may be used as a crack stopping mechanism. In this way the fatigue properties of the composite may be influenced. Most composites are based on organic resin matrices but metal, carbon and ceramic matrices for higher temperature applications are also mentioned. R.J.F.

**N83-17613#** Delaware Univ., Newark.
**MICROMECHANICAL MODELS FOR THE STIFFNESS AND STRENGTH OF FIBER COMPOSITES**
R. Byron Pipes *In* AGARD Pract. Considerations of Design, Fabric. and Tests for Composite Mater. Sep. 1982 9 p (For primary document see N83-17609 08-24)
Avail: NTIS HC A09/MF A01

One of the major goals of micromechanical models of polymer matrix composites is the prediction of anisotropic material descriptors required in the analysis and design of composite structures. The subsequent coupling of the various scales (micro, mini, and macro) of approach provides an overall design methodology which can fully exploit the potential for tailoring simultaneously material and structure to a given application. Design and analysis of composite materials and structures proceeds at several scales. First, the field of micromechanics examines the individual roles of fiber and matrix in determining bulk composite properties. Contemporary micromechanical models capable of predicting transport properties of composite materials consisting of collimated fibers in isotropic matrices (unidirectional lamina) are discussed. The second scale of examination is often termed minimechanics. At this level the influence of the unidirectional lamina and its orientation upon the properties of the mutidirectional laminates is investigated. By varying the orientation of laminae it is possible to produce laminates of widely varying properties. Finally, the multidirectional laminate is viewed as a homogeneous material at the macromechanical scale where the geometry of the structure is designed. R.J.F.

**N83-17614#** Delaware Univ., Newark.
**INTRODUCTION TO THIN LAMINATE THEORY**
R. Byron Pipes *In* AGARD Pract. Considerations of Design, Fabric. and Tests for Composite Materials Sep. 1982 11 p (For primary document see N83-17609 08-24)
Avail: NTIS HC A09/MF A01

In contrast to micromechanical models which utilize fiber and matrix properties to predict properties of the equivalent homogeneous composite material, laminate theory predicts the behavior of multidirectional laminates from the properties of individual lamina consisting of unidirectional, woven or discontinuous fibers. The lamina is viewed as homogeneous and possessing orthotropic symmetry and as such is the building block for the multidirectional laminate. Laminate theory offers a systematic way to analyze the laminate for prediction of properties of an equivalent homogeneous material, state of stress and strain within each of the lamina, and prediction of failure of any lamina within the laminate. Thus laminate properties and behavior are considered in the macroscopic analysis of a composite structure wherein the fiber and matrix properties are no longer identified. Yet through laminate theory and micromechanics it is possible to trace the effects of constituent properties upon overall structural performance. Author

**N83-17615#** Royal Aircraft Establishment, Farnborough (England). Materials Dept.
**FRACTURE OF COMPOSITES AND DAMAGE TOLERANCE**
Graham Dorey *In* AGARD Pract. Considerations of Design, Fabric. and Tests for Composite Mater. Sep. 1982 12 p refs (For primary document see N83-17609 08-24)
Avail: NTIS HC A09/MF A01

Composite fracture and damage tolerance are discussed. Composite materials are anisotropic in stiffness and in strength, and hence local stresses and strains within these materials are complex. They are also inhomogeneous and may have weak interfaces, which makes fracture more probable in certain directions. Fracture modes are therefore generally more complex than in isotropic homogeneous materials such as unreinforced metals and plastics. Advanced fiber composites tend preferentially to split parallel to the fibers, the initial fracture energy depending mainly on the matrix properties and the fiber-matrix interfacial bond strength; but, due to fiber misalignment, further fracture propagation depends on the fiber and interface properties. The three main stress modes to produce splitting are described. Fracture across fibers is more difficult and some of the energy absorbing mechanisms are discussed. In multidirectional laminates each ply still tends to split parallel to the fibers but the constraints of adjoining plies are significant and the fracture mechanisms and fracture energies depend on the ply orientations and stacking sequence (lay-up) and the ply thickness as well as on the usual fiber, matrix and interface properties. Author

**N83-17616#** Fraunhofer-Inst. fuer Betriebsfestigkeit, Darmstadt (West Germany).
**MECHANISMS OF FATIGUE DAMAGE AND FATIGUE TESTING**
J. J. Gerharz *In* AGARD Pract. Considerations of Design, Fabric. and Tests for Composite Mater. Sep. 1982 20 p refs (For primary document see N83-17609 08-24)
Avail: NTIS HC A09/MF A01

The fatigue response of fiber composite materials containing various details of a composite structure is considered. Besides the plain feature, open holes, bolted and bonded joints with differing configuration parameters are covered. All test samples had the same material and laminate structure namely graphite/epoxy

914C/T300 and the laminate built-up. Response of fiber composites to constant amplitude loading of plain and notched materials is addressed. Author

**N83-17617#** Fraunhofer-Inst. fuer Betriebsfestigkeit, Darmstadt (West Germany).
**PREDICTION OF FATIGUE FAILURE**
J. J. Gerharz *In* AGARD Pract. Considerations of Design, Fabric. and Tests for Composite Mater. Sep. 1982 22 p refs (For primary document see N83-17609 08-24)
Avail: NTIS HC A09/MF A01

Because no inexpensive and simple inspection methods presently exist for composites, the residual strength distribution is determined. The interest is in the lower end of the frequency distribution and therefore the Weibull extreme value distribution is used to describe the weakest element. Author

**N83-17618#** Royal Aircraft Establishment, Farnborough (England).
**THE ELECTRICAL PROPERTIES OF CARBON FIBRE COMPOSITES**
J. M. Thomson *In* AGARD Pract. Considerations of Design, Fabric. and Tests for Composite Mater. Sep. 1982 15 p refs (For primary document see N83-17609 08-24)
Avail: NTIS HC A09/MF A01

The essential electrical difference between a carbon fiber composite and conventional metal alloys is that its resistivity is about three orders higher. This fact affects the electromagnetic compatibility (EMC) of the airframes, its performance as an antenna ground plane, the provision of power and of Earth returns and radar cross-section. Research on the electrical properties of carbon fiber composites under these headings is reviewed and the importance of good bonding and jointing emphasized. The major problem areas (which tend to occur at frequencies less than 30 MHz) are outlined, as are those areas where problems are likely to be minor. Although electrical research lags structures and materials research by some 10 to 15 years, nonetheless sufficient work has been due for some interim design recommendations to be formulated, and these are discussed. Author

**N83-17619#** Royal Aircraft Establishment, Farnborough (England). Materials Dept.
**ENVIRONMENTAL DEGRADATION OF COMPOSITES**
Graham Dorey *In* AGARD Pract. Considerations of Design, Fabric. and Tests for Composite Mater. Sep. 1982 13 p refs (For primary document see N83-17609 08-24)
Avail: NTIS HC A09/MF A01

Advanced composite materials comprise well ordered high strength fibers in a matrix of organic polymer, metal or ceramic material. Carbon fibers are inert to most environments except high temperature oxidizing atmospheres. Ceramic fibers such as glass are sensitive to surface microcracks and can lose strength in corrosive media. Most organic polymers, including aramid fibers and epoxy resins absorb moisture which can affect their chemical structure and typically reduce their high temperature performance. Composites may, in addition, be affected at the fiber/matrix interface, which plays an important part in composite behavior. Certain combinations of moisture and temperature can cause irreversible damage which degrades the composite properties, especially matrix or interface domonated properties such as shear strength or compressive strength, particularly at elevated temperatures. It is important therefore to have sufficient information about the absorption and desorption kinetics to be able to predict the moisture content of composite components in their service environment, and to know what effect that moisture will have on their properties. Author

**N83-17620#** Grumman Aerospace Corp., Bethpage, N.Y. Automated Manufacturing Systems Development Section.
**MANUFACTURING PROCESSES FOR AERONAUTICAL STRUCTURES**
Richard Hadcock and John Huber *In* AGARD Pract. Considerations of Design, Fabric. and Tests for Composite Mater. Sep. 1982 13 p refs (For primary document see N83-17609 08-24)
Avail: NTIS HC A09/MF A01

Current manufacturing processes for fabricating composite aeronautical structures are reviewed. Laminating, autoclave curing, hot press molding, injection molding, pultrusion. drilling and trimming are discussed for three principal composite materials - boron/epoxy, graphite/epoxy and Kevlar/epoxy. The unique manufacturing operations associated with each type of material up to and including the curing process are emphasized. The effect of various tooling concepts and materials on production rates and costs is discussed. Unique processing equipment developed for the several composite materials forms available is described. E.A.K.

**N83-17621#** Grumman Aerospace Corp., Bethpage, N.Y. Automated Manufacturing Systems Development Section.
**SPECIFIC EXAMPLES OF AEROSPACE APPLICATIONS OF COMPOSITES**
Richard Hadcock and John Huber *In* AGARD Pract. Considerations of Design, Fabric. and Tests for Composite Mater. Sep. 1982 13 p refs (For primary document see N83-17609 08-24)
Avail: NTIS HC A09/MF A01

The state of the art for the use of composites in both prototype and production, structural and nonstructural aerospace components is reviewed. Historic material usage trends for both commercial and military applications are presented. The applications show the evolution of composite components from relatively simple parts to the current, large and complex structures. The use of composite materials in the new generation of commercial transport aircraft is presented. Specific areas of application, such as spoilers, flaps and fairings, are discussed for impact on part weight, type of construction, and material selection factors. Selected, major composite programs for military aircraft, are reviewed. Composite materials used in these aircraft are analyzed with respect to the percent of the structural weight, type of material utilized, areas of application, type of construction and special manufacturing processes used in production. The test procedures utilized to evaluate composite structures are reviewed. E.A.K.

**N83-17622#** Bath Univ. (England). School of Materials Science.
**ASSESSMENT OF STRUCTURAL INTEGRITY OF COMPOSITES BY NON-DESTRUCTIVE METHODS**
Bryan Harris *In* AGARD Pract. Considerations of Design, Fabric. and Tests for Composite Mater. Sep. 1982 22 p refs Sponsored in part by the UK Science and Engineering Research Council (For primary document see N83-17609 08-24)
Avail: NTIS HC A09/MF A01

Composite materials, and particularly structural reinforced plastics, often contain defects as a result of normal manufacturing procedures. During proof testing or service loading additional defects of other kinds are produced. These defects all affect the mechanical properties of the composites and it is important for designers to be aware of their effects and to allow for their presence. A variety of techniques is used to evaluate the quality of composite materials and structures and to study the accumulation of damage in composites subjected to stress, creep, fatigue or impact conditions. Optical methods, X-radiography, ultrasonic techniques, thermal imaging, and acoustic emission analysis are methods capable of revealing certain aspects of the development of damaged regions in a composite, but the usefulness of most of these is limited to certain types of material or specific structural situations. No single technique will prove to be capable of giving a complete picture of the damaged state of a composite to permit satisfactory life prediction, and more refined methods of detecting localized damage levels. E.A.K.

# 25 INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

For related information see also *77 Thermodynamics and Statistical Physics.*

**N83-17623** Royal Signals and Radar Establishment, Malvern (England).

**DETERMINATION OF OXYGEN AND CARBON IN SILICON WAFERS**

R. W. Series Aug. 1982 25 p refs

(RSRE-3479; BR85269) Copyright. Avail: Issuing Activity

Possibilities for the use of a dispersive infrared spectrophotometer to determine the oxygen and carbon content of device quality silicon wafers were examined. A novel approach to the analysis of the spectra based on a curve fitting method was employed. This was shown to provide very good rejection of interferences due to absorptions caused by precipitates present in heat treated material. Single instrument precisions for measurements on 350 micron device quality wafers of better than 10% for oxygen and + or - 2 x 10 to the 16th power atom cu cm for carbon with no correction for wafer backsurface Author

**N83-17624** Department of Industry, London (England).

**ELECTROPLATING FOR ENGINEERING TECHNICIANS**

D. J. Ashby (City of Birmingham Polytech., Engl.) 1982 25 p refs

Copyright. Avail: Issuing Activity

A detailed account of electroplating processes is given. The theory of electrodeposition is explained. Selected bathing solutions; alloy deposition; vat and tank electrodeposition; and common electroplating processes using nickel, chromium, zinc, and copper are discussed. Factors requiring careful control during electrodeposition are discussed. R.J.F.

**N83-17625*#** California Univ., Santa Barbara. Quantum Inst.

**LASER FLUORESCENCE STUDIES OF THE CHEMICAL INTERACTIONS OF SODIUM SPECIES WITH SULFUR BEARING FUELS Final Report, Mar. 1979 - Dec. 1981**

Martin Steinberg and Keith Schofield 25 Jan. 1983 24 p refs (Contract NsG-3256)

(NASA-CR-169861; NAS 1.26:169861) Avail: NTIS HC A02/MF A01 CSCL 07D

By using a large matrix of fuel rich and fuel lean H2/O2/N2 and fuel rich C2H2/O2/N2 flames, the behavior of sodium and its interactions with sulfur at high temperatures was extensively characterized. OH concentrations were measured for each flame using the previously validated laser induced fluorescence technique. Sodium atomic concentrations were obtained by the saturated laser fluorescence method. Measurements were made in the absence and presence of up to 2% sulfur. In oxygen rich systems sodium is depleted by NaO2 and NaOH formation. The relative amounts of each are controlled by the degree of nonequilibration of the flame radicals and by the temperature. The bond strength of NaO2 was established. For the first time, a complete understanding of the complex behavior of sodium in fuel lean H2/O2 flames has emerged and computer modeling has permitted various rate constants of Na, NaO2 and NaOH reactions to be approximately fixed. S.L.

**N83-17626*#** California Univ., Santa Barbara. Quantum Inst.

**THE DETAILED CHEMISTRY AND THERMODYNAMICS OF SODIUM IN OXYGEN-RICH FLAMES**

A. J. Hynes (Oberlin Coll., Ohio), M. Steinberg, and K. Schofield 1982 27 p refs Presented at the Fall Meeting of the Western States Sect. of the Combust. Inst., Livermore, Calif., 11-12 Oct. 1982

(Grant NsG-3256; Contract DE-AM03-76SF-00034)

(NASA-CR-169848; NAS 1.26:169848; WSCI-82-45) Avail: NTIS HC A03/MF A01 CSCL 07D

Measurement of sodium and OH concentrations in ten oxygen-rich H2/O2/N2 flames by respective saturated and low-power laser induced fluorescence techniques have permitted a detailed examination of the pronounced flame chemistry of sodium in such oxygen rich media. Previous interpretations have been shown to be largely incomplete or in error. The flame downstream profiles indicate that the amount of free sodium tracks the decay of H-atom and as the flame radicals decay sodium becomes increasingly bound in a molecular form. A detailed kinetic model indicates that the sodium is distributed between NaOH and NaO2 species. Concentrations of NaO are very small and NaH negligible. The actual distribution is controlled by the state of equilibrium of the flames' basic free radicals. Na, NaO2 and NaOH are all coupled to one another by fast reactions which can rapidly interconvert one to another as flame conditions vary. Above about 2000K, NaOH becomes dominant whereas NaO2 plays an increasingly important contribution at lower temperatures. B.W.

**N83-17627*#** Southern Univ., Shreveport, La. Dept. of Chemistry.

**A STUDY OF THE PHOTOCATALYTIC EFFECTS OF AQUEOUS SUSPENSIONS OF PLATINIZED SEMICONDUCTOR MATERIALS ON THE REACTION RATES OF CANDIDATE REDOX REACTIONS Final Report**

Allen M. Miles Sep. 1982 21 p refr

(Contract NAG1-162)

(NASA-CR-169887; NAS 1.26:169887) Avail: NTIS HC A02/MF A01 CSCL 07D

The effectiveness of powdered semiconductor materials in photocatalyzing candidate redox reactions was investigated. The rate of the photocatalyzed oxidation of cyanide at platinized TiO2 was studied. The extent of the cyanide reaction was followed directly using an electroanalytical method (i.e. differential pulse polarography). Experiments were performed in natural or artificial light. A comparison was made of kinetic data obtained for photocatalysis at platinized powders with rate data for nonplatinized powders. S.L.

**N83-17628*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

**STEAM COOLED RICH-BURN COMBUSTOR LINER Patent Application**

Donald F. Schultz, inventor (to NASA) Filed 23 Dec. 1982 10 p (NASA-Case-LEW-13609-1; US-Patent-Appl-SN-452465) Avail: NTIS HC A02/MF A01 CSCL 21B

Stress on the wall of the primary combustor is minimized. Thus, the steam pressure in the inlet manifold is approximately the same as the combustor discharge pressure at the throat, and annular expansion tubes minimize stresses in the jacket. The second combustor accomplishes lean burning of the gases discharged from primary combustor. The combination of the rich burning of heavy fuels followed by lean burning minimizes the NOx in the exhaust gas discharged from combustor. The novelty of the invention appears to lie in cooling a rich burn combustor with spiral streams of saturated steam flowing between the combustor linear and the jacket at a predetermined pressure; the jacket including stress relief means. NASA

**N83-17629#** Gesellschaft fuer Kernenergieverwertung in Schiffbau und Schiffahrt m.b.H., Geesthacht (West Germany).

**MULTI-ELEMENT ANALYSIS IN AEROSOLS BY NEUTRONIC ACTIVATION ANALYSIS AND X-RAY FLUORESCENCE ANALYSIS WITH TOTAL REFLECTING SAMPLE HOLDER Thesis - Hamburg Univ. [MULTIELEMENTANALYSE VON AEROSOLEN MITTELS DER NEUTRONENAKTIVIERUNGSANALYSE UND DER ROENTGENFLUORESZENZANALYSE MIT TOTALREFLEKTIERENDEM PROBENTRAEGER]**

P. Ketelsen (Hamburg Univ.) 12 May 1982 256 p refs In GERMAN; ENGLISH summary

(GKSS-82-E-20; ISSN-0344-9629) Avail: NTIS HC A12/MF A01

For the analysis of aerosol samples on filters several methods for the energy dispersive X-ray Fluorescence Analysis with Totally Reflecting Sample Holder (TRXFA) with Mo-exitation were devel-

oped and investigated for systematic errors. The elements K, Ca, Ti, V, Cr, Mn, Fe, Ni, Cu, Zn, As, Se, Br, Rb, Sr, Pb and Ba are detectable with high sensitivity. For the improved detection of short lifed nuclides (t sub 1/2 = 2 - 50 h) with the Neutron Activation Analysis (NAA) a radiochemical procedure for the separation of Na-24 and Br-82 was developed. The results of TRXFA and NAA correspond well. The capabilities of the developed methods wee demonstrated on a set of size fractionated aerosol samples.
Author

**N83-17630#** Hamburger Wasserwerke G.m.b.H. (West Germany).
**REVERSE OSMOSIS OR ELECTRODIALYSIS FOR THE DESALINATION OF GROUND WATER AS WELL AS REMOVAL OF SOLUTED ORGANIC SUBSTANCES Final Report, Jan. 1982**
Hinrich Woldmann and Juergen Kaschemekat (Ges. fuer Kernenergieverwertung in Schiffbau und Schiffahrt mbH, Geesthacht, West Germany) Bonn Bundesministerium fuer Forschung und Technologie Oct. 1982 71 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-82-181; ISSN-0340-7608) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 15

Achievement of desired water quality by reverse osmosis was demonstrated by ground water treatment tests using nonaerated brackish well water as feed for the production of drinking water. The treatment costs is unacceptably high at present. Thus the use of reverse osmosis for drinking water production in our region may be considered only under exceptional circumstances. The electrodialysis plant proved to be rather sensitive towards scaling, limiting the desalinations capability of the system used. Attempts to reduce high organic contents (humic acids) by reverse osmosis causes rapid membrane fouling, suggesting that alternative treatment methods should be considered. E.A.K.

**N83-17631#** System Planning Corp., Arlington, Va.
**THERMOCHEMICAL CONSIDERATIONS IN SELF-SUSTAINING SYNTHESIS OF REFRACTORY COMPOUNDS**
William L. Frankhouser and Stephen T. Sullivan Aug. 1982 54 p refs
(AD-A121254; SPC-814) Avail: NTIS HC A04/MF A01 CSCL 07/4

Thermochemical relationships in synthesis of refractory compounds have been considered. The heat generated from elemental reactants in this synthesis process provides the thermal input for the gasless combustion process. Trends are shown that relate position of the elemental reactants in the periodic table and gram molecular weight of the reacted products to a thermochemical potential factor (TPF). The TPF is obtained by dividing heat of reaction with adiabatic reaction temperature. Suggestions are made to perform laboratory scoping experiments with BeB2, ScH2, TiB2, and W2C to confirm the thermochemical relationships in self-sustaining synthesis. Author (GRA)

**N83-17632#** California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
**ELECTROCHEMICAL STUDIES OF THE FILM FORMATION ON LITHIUM IN PROPYLENE CARBONATE SOLUTIONS UNDER OPEN-CIRCUIT CONDITIONS**
Y. Geronov, F. Schwager, and R. H. Muller Nov. 1981 40 p refs Presented at the Meeting of the Electrochem. Soc., Hollywood, Fla., 5-10 Oct. 1980
(Contract W-7405-eng-48)
(DE82-010166; LBL-12102-Rev-2; CONF-801059-13-Rev-2) Avail: NTIS HC A03/MF A01

The nature of protective surface layers formed on lithium in propylene carbonate solutions of LiClO4 and LiAsF6 at open circuit has been investigated by electrochemical pulse measurements. The results are consistent with the fast formation of a compact thin layer resulting from the reaction with residual water. This layer acts as a solid ionic conductor. Slow corrosion or decomposition processes produce a thicker porous overlayer.DOE

**N83-17633#** General Atomic Co., San Diego, Calif.
**STATUS REPORT ON SULFUR IODINE THERMOCHEMICAL WATER-SPLITTING CYCLE**
G. E. Besenbruch, L. C. Brown, M. Yoshimoto, J. H. Norman, D. R. OKeefe, M. Endo, C. L. Allen, M. L. Kelly, and P. W. Trester Nov. 1981 9 p refs Presented at the Intern. Colloq. on Use of Nucl. Heat for Process Appl., Aachen, 17 Sep. 1981
(Contracts DE-AC01-80CS-80004; DE-AC02-80ET-26225)
(DE82-007164; GA-A-16610; CONF-8109102-2) Avail: NTIS HC A02/MF A01

Major process improvements were investigated and their feasibility demonstrated. The engineering process flowsheet was revised to incorporate this. It is being used for an estimate of hydrogen production cost. An energy storage cycle for a solar adaptation of the sulfur iodine cycle was identified and is being evaluated along with features particularly concerning the availability and level of insolation and how it affects engineering design of the chemical plant. Efforts are also underway to design the sulfur iodine cycle around the Tandem Mirror Fusion Reactor. Potential systems for HI purification are being investigated which could eliminate the need for the phosphoric acid treatment completely and could result in significant savings in capital cost for this part of the process. Potential catalysts for the liquid HI decomposition step were evaluated. DOE

**N83-17634#** Tennessee Univ., Knoxville. Dept. of Chemistry.
**PHYSICAL-CHEMICAL STUDIES OF TRANSURANIUM ELEMENTS Progress Report, 1 Apr. 1981 - 31 Mar. 1982**
Joseph R. Peterson and Richard G. Haire 1982 45 p ref
(Contract DE-AS05-76ER-04447)
(DE82-006799; DOE/ER-04447/137) Avail: NTIS HC A03/MF A01

Our continuing program to determine, interpret, and correlate the basic chemical and physical properties of the transuranium elements is summarized for the period April 1, 1981, through March 31, 1982. Emphasis is given to the major advances. L.F.M.

**N83-17635#** Northwestern Univ., Evanston, Ill. Dept. of Mechanical and Nuclear Engineering.
**THEORETICAL STUDIES ON HETEROGENEOUS COMBUSTION Progress Report, 1 Mar. - 15 Dec. 1981**
Chung K. Law 1982 14 p
(Contract DE-AC02-77ER-04433)
(DE82-006911; DOE/ER-04433-5) Avail: NTIS HC A02/MF A01

In most of the liquid fueled chemical power plants the fuel is usually introduced into the combustor in the form of a spray jet consisting of an ensemble of droplets. The spray subsequently ignites and burns, releasing chemical energy to perform work and, at the same time, producing trace pollutants which are subsequently exhausted. In order to improve the combustor performance in terms of cleanliness and efficiency, understanding of the combustion characteristics of fuel spray is essential. The present program aims to study the various heterogeneous processes involved during (1) vaporization, ignition, deflagration, and extinction of single fuel droplets in the reactive environment simulating the spray interior, and (2) the vaporization, ignition, and combustion of the spray as a whole. The approach is primarily theoretical, although occasionally simple experiments have been conducted to complement the theoretical predictions. DOE

**N83-17636#** Korea Advanced Energy Research Inst., Seoul.
**DEVELOPMENT OF CHEMICAL ANALYSIS TECHNIQUES**
1981 170 p refs In JAPANESE; ENGLISH summary
(DE82-700241; KAERI/RR-210/80) Avail: NTIS (US Sales Only) HC A08/MF A01; DOE Depository Libraries

Several chemical analysis techniques are discussed in the several papers presented. Emphasis is placed on techniques for analyzing nuclear materials and rare earth elements. L.F.M.

**N83-17637#** Purdue Univ., Lafayette, Ind. School of Chemical Engineering.
**MACROMOLECULAR STRUCTURAL CHANGES IN BITUMINOUS COALS DURING EXTRACTION AND SOLUBILIZATION**

**Quarterly Technical Progress Report, 1 Sep. - 1 Dec. 1981**
Nikolaos A. Peppas 1981 39 p refs
(Contract DE-FG22-80PC-30222)
(DE82-004941; DOE/PC-30222/T2) Avail: NTIS HC A03/MF A01

Data are presented of the effect of coal pretreatment (extraction, flotation etc.) and porous structure on the apparent and effective swelling of several coals by four swelling agents. Analysis of the pore structure was achieved by mercury porosimetry and pyconometry. The effect of retained solvent in the pores is more prominent in the determination of the equilibrium coal volume fraction and the actual molecular weight between crosslinks, M/sub c/. DOE

**N83-17638#** Colorado School of Mines, Golden. Dept. of Chemical and Petroleum-Refining Engineering.
**PHASE EQUILIBRIUM PROPERTIES OF COAL DERIVED LIQUIDS Technical Progress Report, Jul. - Dec. 1981**
V. F. Yesavage and A. J. Kidnay 1 Jan. 1982 21 p
(Contract DE-FG22-80PC-30230)
(DE82-007006; DOE/PC-30230/23) Avail: NTIS HC A02/MF A01

The objective of the present study is to measure equilibrium K values of coal derived liquids and model compounds representative of coal liquids, and to use the results in the development of engineering correlations. The program is divided into three major areas: (1) Design, construction, and evaluation of an equilibrium flash vaporization system for temperatures between 70 and 700 F, at pressures up to 2000 psia, (2) Measurements on samples of both coal derived liquids and mixtures of model compounds, (3) Preparation of engineering correlations for the measured K values and vapor liquid equilibria. Calibration of the pressure and temperature measuring equipment was completed. The system was tested for a single component system by reproducing the vapor pressure curve for pure water. Work was started on the water ethanol binary system and one data point was obtained. These components were selected because reliable data for these components are available for comparison. DOE

**N83-17639#** Washington State Univ., Pullman. Dept. of Mechanical Engineering.
**CHARACTERISTICS OF COAL/LIGHT HYDROCARBON SLURRIES IN SPRAY COMBUSTION Quarterly Progress Report, 1 Sep. - 30 Nov. 1981**
William L. Grosshandler, Clayton T. Crowe, and Jacob N. Chung Dec. 1981 17 p
(Contract DE-FG22-80PC-30216)
(DE82-006294; DOE/PC-30216/T3) Avail: NTIS HC A02/MF A01

Research activities are summarized. Some progress on each of the three major tasks has been accomplished, but no new significant results have been obtained. A redesign of the spray facility is underway to give more reliable size distribution measurements. The numerical model is being expanded to include evaporation and combustion in both the high and low Reynolds number limits. Recent measurements of temperature within the opposed flow diffusion burner are reported for air/propane mixtures. Attempts to measure coal particle velocity in cold flow tests are also discussed. DOE

**N83-17640#** Department of Energy, Portland, Oreg.
**COMBUSTION OF SOLVENT-REFINED COAL IN A 100 HP FIRETUBE BOILER Final Test Report**
Y. S. Pan, D. E. Wieczenski, R. B. Snedden, G. T. Bellas, J. I. Joubert, A. R. Curio, and D. J. Wildman 1982 48 p refs
(DE82-007670; DOE/PETC/TR-82/5) Avail: NTIS HC A03/MF A01

Although solid Solvent Refined Coal (SRC-1) was burned successfully in a coal designed utility boiler in 1977, the feasibility of using this fuel in more compact oil or gas designed units at significantly higher heat liberation rates remained uncertain. Combustion tests were conducted at the Pittsburgh Energy Technology Center using a 100 hp (3450 lb of steam per hour) firetube boiler, designed to burn No. 6 oil. The test results indicate that SRC-1, including the solid form, can probably be burned without derating in larger oil designed industrial boilers of watertube design. Such units usually operate at heat liberation rates in the range of 25,000-50,000 Btu/cu ft. hr, significantly lower than rates employed in these tests. DOE

**N83-17641#** Battelle Columbus Labs., Ohio.
**CaO INTERACTIONS IN THE STAGED COMBUSTION OF COAL Quarterly Technical Progress Report, 1 Oct. - 31 Dec. 1981**
Arthur Levy, Earl L. Merryman, and Bruce W. Rising 1908 38 p refs
(Contract DE-AC22-80PC-30301)
(DE82-010299; DOE/PC-30301/5; QTPR-5) Avail: NTIS HC A03/MF A01

Study of the reaction of sulfur bearing compounds with CaO to form CaS was completed. A study of the oxidation of CaS is well underway and a study of kinetic and chemical parameters governing CaS and CaSO4 formation in staged combustion, was continued. The results suggest that CaS oxidation to sulfate in the second stage of a two-stage combustion process may not proceed very rapidly. Results to date from the methane-coal studies show that sulfur retention in fuel-rich firings is dependent on reaction temperature and equivalence ratio. DOE

**N83-17642#** Rockwell International Corp., Thousand Oaks, Calif.
**STUDIES OF THE MECHANISM OF COAL HYDROGENATION BY ELECTRON SPIN RESONANCE Quarterly Technical Progress Report, 1 Dec. 1980 - 28 Feb. 1981**
Ira B. Goldberg and Ted A. McKinney Oct. 1981 31 p refs
(Contract DE-AC22-80PC-30072)
(DE82-005162; DOE/PC-30072/T5A; QTPR-4) Avail: NTIS HC A03/MF A01

Work carried out during this period includes preliminary experiments involving heating Illinois No. 6 Burning Star Mine coal at up to 10.5 MPa of H sub 2 or He between 380 C and 500 C. Suggestions for microwave cavity modifications to improve heating rate and uniformity and magnetic field homogeneity are made as a result of certain problems which were encountered. DOE

**N83-17643#** Brookhaven National Lab., Upton, N. Y.
**DETERMINING ELECTROCHEMICAL PARAMETERS WITH DUAL ELECTRODES**
R. Bandy and D. vanRooyen 1981 15 p refs Presented at the Electrochem. Soc. Conf., Denver, 11 Oct. 1981
(Contract DE-AC02-76CH-00016)
(DE82-005510; BNL-30374; CONF-811013-13) Avail: NTIS HC A02/MF A01

Use of the two electrode method for determining corrosion rates and Tafel constants is described. The method involves polarization resistance measurements, as well as polarization data further from the corrosion potential. Combined treatment of these data enables the determination of Tafel constants and corrosion rates. It is also shown that values for corrosion potentials can be obtained with good accuracy when exchange current densities of anodic and cathodic reactions are known. This method overcomes some of the earlier drawbacks of the two electrode technique, such as the need for separate, three electrode Tafel constant determinations. DOE

**N83-17644#** Sandia Labs., Albuquerque, N. Mex.
**HYDROGEN COMBUSTION RESEARCH AT SANDIA**
Marshall Berman 1981 36 p refs Presented at the Intern. Spec. Meeting on Fuel-Air Explosion, Montreal, Canada, 4-6 Nov. 1981
(Contract DE-AC04-76DP-00789)
(DE82-006768; SAND-82-0086C; CONF-811124-4) Avail: NTIS HC A03/MF A01

The reactor safety community has always been aware of the possibility of generating hydrogen during an accident in a light water reactor (LWR). It was always assumed, however, that the licensing requirements were sufficient to limit the amount of hydrogen generated during design basis accidents to a level low

enough to provide a safety margin. The accident at Three Mile Island Unit 2 (TMI-2), however, resulted in a much higher release (estimated to be between 150 and 600 kg). A large fraction of this hydrogen was consumed during a combustion in the containment which occurred at 9 hours 50 minutes into the accident, and generated overpressures of more than 28 psig. There was also a period during the accident when hydrogen combustion within the primary system was considered possible. In this paper, the nature of the hydrogen behavior problem for LWRs in the US is described. DOE

**N83-17645#** General Electric Co., Schenectady, N. Y.
**CATALYTIC EFFECTS OF ALKALI METAL SALTS IN THE GASIFICATION OF COAL CHAR**
D. W. McKee, C. L. Spiro, P. G. Kosky, and E. J. Lamby 1982 30 p refs Presented at the 183rd Am. Chem. Soc. Ann. Meeting Symp. on Coal Gasification, Las Vegas, Nev., 28 Mar. - 2 Apr. 1982
(Contract DE-AC21-80MC-14591)
(DE82-000850; CONF-820304-2) Avail: NTIS HC A03/MF A01

The kinetics of gasification, in carbon dioxide and steam, of a char derived from Illinois No. 6 coal doped with small amounts of alkali metal salts are discussed. A progressive loss in catalytic activity was observed during the course of the steam gasification reaction at 700 to 1000 C and on thermal cycling between gasification temperatures and 25 C. This deactivation appeared to result from reaction of the alkali salts with mineral matter in the char. The catalytic behavior of the alkali carbonates are discussed in terms of sequences of elementary reactions involving interaction of the catalyst particles with the carbon substrate and with the gaseous environment. DOE

**N83-17646#** Exxon Research and Engineering Co., Linden, N.J.
**SYNTHETIC FUEL EFFECTS IN CONTINUOUS COMBUSTION SYSTEMS: AN EXPERIMENTAL STUDY OF FUEL NITROGEN CONVERSION IN JET-STIRRED COMBUSTIONS**
Ralph M. Kowalik and Lawrence A. Ruth 1982 24 p refs Presented at the 183rd Am. Chem. Soc. Ann. Meeting Symp. on the Combustion of Synthetic Fuels, Las Vegas, Nev., 29 Mar. - 2 Apr. 1982
(Contract DE-AC22-77ET-11313)
(DE82-002686; CONF-820304-7) Avail: NTIS HC A02/MF A01

Results from laboratory jet stirred combustor experiments suggest that the conversion of fuel bound nitrogen to total fixed nitrogen (TFN) in fuel rich mixtures is strongly related to the concentration of unburned hydrocarbons (HCs) within the combustor. Most conversion trends with equivalence ratio, residence time, and combustor type may be explained in terms of the effects of these variables on HC concentrations. Changes in these variables which reduce HC's generally reduce the degree of fuel nitrogen conversion. Fuel type (isooctane vs. toluene) effects on conversion appear to be most pronounced for very rich (psi = 1.8), short residence time (tau < or = 10ms) conditions. At these conditions toluene mixtures produce less TFN and more soot. This trend may be related to an interaction between soot and HCN. DOE

**N83-17647#** SRI International Corp., Menlo Park, Calif.
**WORKSHOP ON THE STATUS OF INDUSTRIAL ORGANIC ELECTROCHEMISTRY, SUMMARY**
K. Kinoshita, R. D. Weaver, and L. Nanis (Electrochemical Engineering) Dec. 1981 94 p refs Workshop held at Menlo Park, Calif., 9 Apr. 1981 Sponsored by Electric Power Research Inst.
(EPRI Proj. 1086-9)
(DE82-901982; EPRI-EM-2173; CONF-8104138-Summ) Avail: NTIS HC A05/MF A01

The status of electrochemical synthesis of industrially important organic compounds was discussed. Interest in electroorganic synthesis stems from the desire of the utility industry to substitute base load electricity derived from coal fired or nuclear plants in place of oil and gas used in the chemical industry for feedstock and process heating. Electroorganic syntheses would appear to offer such opportunities. The objectives of the workshop were to analyze the state of technology of industrial organic electrochemistry, to discuss the obstacles, and to consider possible methods to advance the development of electroorganic processes. A series of prepared presentations by speakers with industrial and academic research experience served to define the progress, problems, and prospects for electrochemical synthesis of organic compounds. DOE

**N83-17648#** Los Alamos Scientific Lab., N. Mex.
**ALTERNATE THERMOCHEMICAL CYCLES FOR ADVANCED HYDROGEN PRODUCTION**
M. G. Bowman, C. M. Hollabaugh, W. M. Jones, and C. F. V. Mason 1982 15 p refs Presented at the 183rd Am. Chem. Soc. Ann. Meeting, Las Vegas, Nev., 27 Mar. 1982
(Contract W-7405-eng-36)
(DE82-002351; LA-UR-81-3198; CONF-820304-4) Avail: NTIS HC A02/MF A01

Experimental studies have validated three classes of thermochemical cycles (Bismuth sulfate-sulfuric acid, magnesium sulfate-magnesium iodide, and oxide-based) based on high temperature solids decomposition as an endothermic step. Such cycles offer the possibility of high efficiency when coupled with high temperature isothermal heat sources. Methods for handling solids in high temperature decomposition reactions have been tested. The results suggest that efficient and practical cycles can be based on such reactions. DOE

**N83-17649#** California Univ., Los Angeles. Dept. of Chemical Engineering.
**THE SULFUR-CATALYZED RECOMBINATION OF ATOMIC OXYGEN IN A CO/O2Ar FLAME**
Owen I. Smith, Shie-Ning Wang, Spyros Tseregounis (California Univ., Livermore, Lawrence Livermore Lab.), and Charles K. Westbrook Livermore, Calif. California Univ., Livermore, Lawrence Livermore Lab. 28 Jan. 1982 59 p refs Presented at the 1982 Spring Tech. Meeting, Columbus, Ohio, 22-23 Mar. 1982
(Contract W-7405-eng-48)
(DE82-010752; UCRL-87178; CONF-820320-1) Avail: NTIS HC A04/MF A01

Flame structure was determined for two fuel lean, premixed laminar CO/O2/Ar flames, one of which contained 1.2% SO2 by volume. At distances greater than 0.3 cm from the flame holder, the structure of the SO2 doped flame was found to be consistent with a state of balance between the reactions O + SO2 + M reversible SO3 + M and SO3 + O yields SO2 + O2. The catalytic recombination of O atoms practically eliminated the approximately 30% O atom superequilibrium overshoot for the sulfur free flame. Sulfur addition resulted in a considerable increase in temperature, ranging from 50 K near the flameholder to approximately 200 K 1 cm downstream. Flame structures were modeled by solving simultaneously the one dimensional, unsteady conservation equations using an oxidation mechanism including 14 species and 24 elementary reactions. DOE

**N83-17650#** Oak Ridge National Lab., Tenn. Health and Safety Research Div.
**EXPERIMENTAL PROCEDURE FOR EXAMINING THE KINETICS OF TRITIUM GAS CONVERSION TO TRITIATED WATER**
J. E. Phillips and C. E. Easterly Feb. 1982 25 p refs
(Contract W-7405-eng-26)
(DE82-006814; ORNL/TM-7670) Avail: NTIS HC A02/MF A01

Research equipment was designed, fabricated, and evaluated for determining the conversion rate of tritium gas to tritiated water for initial tritium gas concentrations. The equipment includes a vacuum system coupled to a gas handling system for preparing up to 15 reaction vessels having identical tritium gas concentrations. Measured concentrations in 4 or 5 prepared flasks were within 1.6% of their mean. Measured concentrations in all 5 flasks were within 8% of the mean. Good control of the tritium concentration was also achieved. A system was required for sampling tritiated water and tritium gas. Efficient collection of HTO was desired and reproducible collection of HTO and HT were essential. Collection efficiencies for tritiated water of at least 99% were obtained

reproducibly. Collection efficiencies of tritium gas were also 99% or greater and reproducible. DOE

**N83-17651#** California Univ., Livermore. Lawrence Livermore Lab.

**RECENT FLAME-PROPAGATION EXPERIMENTS AT LLNL WITHIN THE LIQUEFIED GASEOUS-FUELS SPILL-SAFETY PROGRAM**

Paul A. Urtiew Dec. 1981 28 p refs Presented at the Intern. Spec. Meeting on Fuel-Air Explosion, Montreal, 4-6 Nov. 1981
(Contract W-7405-eng-48)
(DE82-010729; UCRL-87012; CONF-811124-5) Avail: NTIS HC A03/MF A01

The possible hazardous consequences of large spills of liquefied natural gas are currently under investigation by our Laboratory, under the Liquefied Gaseous Fuels Spill Safety Program. One of the important aspects of the problem is the actual burning of the cloud and all the potential outcomes resulting from it. Described here, are current experimental efforts in this area both in small scale laboratory experiments and large scale field tests. The results of laboratory experiments conducted in semiconfined geometries suggest a strong role of obstacles in the flow. These obstacles can produce turbulence in the flow, and thus, accelerate the flame to several times the laminar burning velocity. The large scale vapor burn tests in the unconfined cloud have not yet been adequately analyzed, but they show some interesting features which are also discussed. DOE

**N83-17652#** Los Alamos Scientific Lab., N. Mex.

**RELATIONSHIP BETWEEN PYRITE FORMATION AND ORGANIC SULFUR CONTENT OF COAL AS REVEALED BY ELECTRON MICROSCOPY**

Robert Raymond, Jr. and Roland C. Hagan 1982 19 p refs Presented at the Scanning Electron Microscop. Conf., Anaheim, Calif. 19-23 Apr. 1982
(Contract W-7405-eng-36)
(DE82-010417; LA-UR-82-113; CONF-820409-2) Avail: NTIS HC A02/MF A01

There are a large number of questions concerning the mode of occurrence of organic sulfur in peat, and what, if anything, alters its occurrence during and after coalification. The formation of pyrite during periods of peatification and coalification has been hypothesized to have a great effect on the organic sulfur content of organic material surrounding the pyrite. Measurement of organic sulfur contents at different distances from pyrite particles would serve as direct experimental proof for or against this pypothesis. A combination of in situ energy dispersive spectrometer line profiles, EDS X-ray maps, and WDS analyses across pyrite/coal interfaces in a variety of coals shows unequivocally that formation of pyrite does not alter the organic sulfur contents of the surrounding coal macerals. DOE

**N83-17653#** Princeton Univ., N. J. Plasma Physics Lab.

**MEASUREMENT OF H2, D2 SOLUBILITIES IN Zr-Al**

R. J. Knize, J. L. Cecchi, and H. F. Dylla Dec. 1981 14 p refs
(Contract DE-AC02-76CH-03073)
(DE82-010327; PPPL-1862) Avail: NTIS HC A02/MF A01

Solubility constants for hydrogen and deuterium in the Zr-Al alloy are: K/sub H/ = exp (11.1(5) - 16900(600)/T9 (Torr/Torr-1/sq g and K/sub D/ = exp (12.2(8) - 16800(600)/T) (Torr/Torr-1/sq g respectively, where K is defined implicity by P = K sq q with P the equilibrium pressure (in Torr) and q the bulk concentration (in Torr-1/g). These values, in conjunction with a model for the solubility, predict that the constant for tritium, K/sub T/ approximately 4 K/sub H/. Consequently, the regeneration of tritium is faster by a factor of four over that for hydrogen at the same temperature, or the tritium regeneration temperature can be reduced approximately 50 K compared to hydrogen for the same regeneration time. DOE

**N83-17654#** Pittsburgh and Midway Coal Mining Co., Englewood, Colo.

**SOLVENT-REFINED COAL (SRC) PROCESS. HEALTH PROGRAMS: INDUSTRIAL HYGIENE, CLINICAL AND TOXICOLOGICAL PROGRAMS Final Report**

W. Hubis Mar. 1982 173 p refs
(Contract DE-AC05-76ET-10105)
(DE82-012465; DOE/ET-10104/48) Avail: NTIS HC A08/MF A01

The health program under the solvent refined coal process contract from January 1, 1976 through December 31, 1981 with particular emphasis on the period January 1, 1980 through December 31, 1981 is discussed. The major areas of activity within the health program were: an industrial hygiene monitoring program, a clinical medical examination program, a personal hygiene and educational program, an epidemiology program. The industrial hygiene monitoring program during the past two years continued evaluation of occupational exposures to various air contaminants. The major emphasis was directed to the development, refinement and implementation of the skin contamination evaluation project. The medical examination program continued to indicate the absence of discernible occupationally related changes in employee medical profiles. In addition, appreciable effort was expended on efforts to develop a single layered garment which would protect workers. DOE

**N83-17655#** Washington Univ., St. Louis, Mo. Dept. of Chemical Engineering.

**THEORETICAL AND EXPERIMENTAL STUDIES OF FIXED-BED COAL GASIFICATION REACTORS Semiannual Technical Progress Report, 1 Sep. 1981 - 28 Feb. 1982**

B. Joseph and M. P. Dudukovic Mar. 1982 16 p ref
(Contract DE-FG22-80PC-30219)
(DE82-009515; DOE/PC-30219/T2) Avail: NTIS HC A02/MF A01

The existing dynamic model of a fixed bed coal gasification reactor was modified to simulate the performance of the fixed bed laboratory reactor. The design of a laboratory fixed bed reactor was completed and construction is under way. Research plans are discussed. DOE

**N83-17656#** Pittsburgh and Midway Coal Mining Co., Englewood, Colo.

**SOLVENT-REFINED COAL (SRC) PROCESS. SELECTED PHYSICAL, CHEMICAL, AND THERMODYNAMIC PROPERTIES OF NARROW BOILING RANGE COAL LIQUIDS FROM THE SRC-2 PROCESS, SUPPLEMENTAL PROPERTY DATA**

J. A. Gray and G. D. Holder Apr. 1982 281 p refs
(Contract DE-AC05-76ET-10104)
(DE82-012489; DOE/ET-10104/44) Avail: NTIS HC A13/MF A01

Vapor pressure and heat of vaporization measurements were performed on six distillate cuts at temperatures to 788 K. The critical point was observed for three of the cuts. The data were in excellent agreement with the results of previous measurements. Surface tension measurements were performed on six distillate cuts, two heavy distillate samples, and one recycle slurry sample at temperatures to 672 K and pressures to 13.9 MPa. The surface tension data exhibited some anomalous behavior and were not fully consistent with previous results. At temperatures above 525 K, the process streams had essentially the same values for surface tension, but differed considerably at lower temperatures. Specific heat measurements were performed on ten fractions at temperatures to 600 K and at saturation pressure. The data were in good agreement with several correlations. Samples of eight internal process streams from PDU P-99 were distilled into 28 K cuts and selected properties were measured. DOE

**N83-17657#** Pittsburgh and Midway Coal Mining Co., Englewood, Colo.

**SOLVENT-REFINED-COAL (SRC) PROCESS. COKING OF SRC-2 PROCESS STREAMS. PART 3: EFFECTS OF COAL MINERALS ON COKING. PART 4: THERMAL PROPERTIES OF SRC-2 COKES AND PROCESS STREAMS Interim Report, Jan. - Sep. 1981**

C. S. Wen Apr. 1982 90 p refs

(Contract DE-AC05-76ET-10104)
(DE82-012369; DOE/ET-10104/38-Pt-3-Pt-4) Avail: NTIS HC A05/MF A01

Studies were made to determine the effects of inherent coal minerals, in particular pyrite/pyrrhotite and kaolinite clay, on coking during coal liquefaction. The results indicated and confirmed that certain coal minerals (pyrite/pyrrhotite) very likely suppress coke formation and others (clays) promote coke formation by acting as coke nucleating agents during coal liquefaction. The thermal behavior of solvent refined coal-2 (SRC-2) process streams and coke like solids was investigated to better understand the mechanism of coke formation during coal liquefaction. Experiments were carried out using pressure differential scanning calorimetric/thermogravimetric techniques in conjunction with Fourier Transform Infrared to determine thermal properties of various SRC-2 cokes and process streams. A correlation between coke heat capacity/enthalpy and their coking parameters was established. Thermal properties of cokes were fit to a set of equations as functions of operating parameters. DOE

**N83-17658#** Pittsburgh and Midway Coal Mining Co., Englewood, Colo.
**SOLVENT-REFINED-COAL (SRC) PROCESS. INTERNAL STREAM MATERIAL BALANCES FOR THE SEPARATION AND FRACTIONATION SYSTEMS ON SRC-2 PROCESS DEVELOPMENT UNIT P-99, RUNS P99-63 TO P99-71**
S. T. Mathias Apr. 1982 231 p refs
(Contract DE-AC05-76ET-10104)
(DE82-012486; DOE/ET-10104/45) Avail: NTIS HC A11/MF A01

The results of component balances for the internal streams on Process Development Unit P-99 for nine solvent refined coal-2 runs (Runs P99-63 through P99-71) are given. These results provide reliable rates and compositions for all the streams in the high pressure separation and fractionation sections. The development of improved sampling techniques and computational procedures to handle deficiencies and inconsistencies in the data were responsible for producing these consistent material balances. The effect of temperature on the fraction of the separator feed that ended up in the gas phase was studied during these runs. Increasing the temperature increased the amount of material in the gas phase. The hot separator temperature was limited to 780 to 800 F due to the potential for coke formation. A temperature of 600 F was necessary for the first intermediate separator to prevent salt deposits from plugging the transfer lines. DOE

**N83-17659#** Pittsburgh and Midway Coal Mining Co., Englewood, Colo.
**SOLVENT-REFINED-COAL (SRC) PROCESS. DATA REDUCTION PROCEDURE FOR SRC-2 RUNS MADE ON PROCESS DEVELOPMENT UNIT P-99**
H. G. McIlvried Mar. 1982 196 p refs
(Contract DE-AC05-76ET-10104)
(DE82-012463; DOE/ET-10104/47) Avail: NTIS HC A09/MF A01

A PL/1 program was written which computes elementally balanced, distillation corrected yields for SRC-2 runs made on process development unit P-99. This program is flexible and efficient and provides an effective tool for evaluating and adjusting individual data items, when this can be justified, to arrive at the most consistent overall set of results. The program produces a printout which is suitable for inclusion in final reports. DOE

**N83-17660#** National Coal Board, Leatherhead (England). Coal Utilization Research Lab.
**PRESSURIZED FLUIDIZED-BED COMBUSTION PART-LOAD BEHAVIOR. VOLUME 1: SUMMARY REPORT**
A. G. Roberts, K. K. Pillai, P. Raven, and P. Wood Morgantown, W. Va. DOE Sep. 1981 119 p
(Contract DE-AC21-80MC-14129)
(DE82-011078; DOE/MC-14129/171) Avail: NTIS HC A06/MF A01

The parts load characteristics of a pressurized fluidized bed combustor for a combined cycle power plant and its behavior during load changing are discussed. Part load operation was achieved by varying the bed temperature by amounts between 200 to 300 F and the bed depth from between 9 and 10 ft at rates varying between 0.2 ft/min and 0.5 ft/min. The performance at part load steady state conditions and during transient conditions is reported with information on combustion efficiency (99% at full load with 9 ft bed depth and 1650 F bed temperature; 95% with 4 ft depth and 1390 F); sulfur retention (95 deg at full load to 80% at low bed depth and low bed temperature); sulfur emissions (no definitive results); NO/sub x/ emissions (tendency for increase as bed temperature was reduced); alkali emissions (no bed temperature effect detected); and heat transfer. It was demonstrated that load can be altered in a rapid and controlled manner by changing combinations of bed depth temperature and pressure. DOE

**N83-17661#** Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.
**EFFECT OF SIMULATED MEDIUM-Btu COAL GASIFIER ATMOSPHERES ON THE BIAXIAL STRESS RUPTURE BEHAVIOR OF FOUR CANDIDATE COAL GASIFIER ALLOYS**
R. M. Horton and G. R. Smolik 1982 23 p refs Presented at the 111th AIME Ann. Meeting, Dallas, 14-18 Feb. 1982
(Contract DE-AC07-76ID-01570)
(DE82-008607; EGG-M-03182; CONF-820205-3) Avail: NTIS HC A02/MF A01

Tests were conducted to determine whether the biaxial stress rupture behavior of four alloys was adversely affected by exposure to four simulated medium-Btu coal gasifier atmospheres. The results of exposures up to approximately 500 hours at temperatures between 649 and 982 C are presented. Exposure to these atmospheres at temperatures below 900 C did not significantly reduce the rupture properties from those measured in air. Only at 982 C were the rupture strength and life in the simulated coal gasifier atmospheres lower than those measured in air at atmospheric pressure. Possible reasons for this reduction in strength/life are discussed. The results of detailed examination of specimen ruptures are also presented. DOE

**N83-17662#** Oak Ridge National Lab., Tenn.
**VACUUM-ULTRAVIOLET SPECTROSCOPY OF MOLECULES USING THIRD-HARMONIC GENERATION IN RARE GASES**
John C. Miller, R. N. Compton, and C. D. Cooper (Georgia Univ., Athens) 1982 11 p refs Presented at the Opt. Soc. of Am. Topical Meeting on Laser Tech. for Extreme Ultraviolet Spectry., Boulder, Colo., 8-10 Mar. 1982
(Contract W-7405-eng-26)
(DE82-009134; CONF-820336-2) Avail: NTIS HC A02/MF A01

A variety of spectroscopic studies in the vacuum ultraviolet region (100 to 200 nm) were performed using tunable, narrow bandwidth (approximately 0.05 A) light produced by third-harmonic generation in rare gases. These experiments include one-photon absorption and photoionization spectroscopy and photoionization threshold determinations. Two-photon ionization studies of nitric oxide, using the vacuum ultraviolet light to probe Rydberg states and the fundamental light to ionize are also presented. These studies demonstrate the simplicity and utility of a laser-based, tunable high-resolution source for vacuum ultraviolet spectroscopy. As a prelude to these studies recent results on third harmonic generation and multiphoton ionization in xenon are discussed. Resonant and nonresonant multiphoton ionization involving one vacuum ultraviolet photon and one or two blue photons is shown to be an important loss mechanism for third harmonic generation. DOE

**N83-17663#** Oak Ridge National Lab., Tenn. Environmental Sciences Div.
**SOIL RADIOCHROMATOGRAPHY USING SUP 22 Na, SUP 85 Sr, AND SUP 58 Co**
B. P. Spalding and W. A. Hoffman Mar. 1982 43 p refs
(Contract W-7405-eng-26)
(DE82-009608; ORNL/TM-8138; ORNL-ESD-1892) Avail: NTIS

HC A03/MF A01

A laboratory study of radionuclide movement and adsorption in soil was performed. A commercial, high-performance, liquid chromatography system, employing an ultraviolet adsorption detector, was supplemented with a real-time radiation monitor of the column effluent. Columns packed with various soils and their size separates were injected with Na 22, Sr85, and Co58 using various CaCl2 solutions for eluting solvents to simulate groundwater. The near identical behavior of Sr85 and Ca allowed the elution volumes of the Sr peaks to be used for the calculation of the cation retention capacities of the soils which agreed with their measured cation exchange capacities. Treatment with NaOH increased the cation exchange capacity of one column by 50%. Acetone or sodium benzoate proved useful for measuring column void volumes using the ultraviolet detector because they eluted at exactly the calculated void volumes for all soil columns. DOE

**N83-17664#** Texas Technological Univ., Lubbock. Dept. of Chemistry.

**METAL-ION COMPLEXATION BY IONIC CROWN ETHERS**

Richard A. Bartsch 22 Dec. 1981 16 p refs

(Contract DE-AS05-80ER-10604)

(DE82-011594; DOE/ER-10604/2) Avail: NTIS HC A02/MF A01

The synthesis of crown ethers which posses pendant carboxylic acid groups; the selectivity and efficiency for solvent extraction of alkali metal and of alkaline earth cations from water into organic solvents by crown ether carboxylic acids were studied. The active transport of alkali metal cations across bulk liquid membranes by crown ether carboxylic acids were also investigated. DOE

**N83-17665#** California Univ., Berkeley. Lawrence Berkeley Lab. Applied Physics and Laser Spectroscopy Group.

**IN SITU ULTRATRACE GAS DETECTION BY PHOTOTHERMAL SPECTROSCOPY: AN OVERVIEW**

Nabil M. Amer Feb. 1982 7 p refs Presented at the Workshop on Opt. and Laser Remote Sensing, Monterey, Calif., 9-11 Feb. 1982

(Contract W-7405-eng-48)

(DE82-008870; LBL-14051; CONF-820230-2) Avail: NTIS HC A02/MF A01

Two photothermal detection schemes, photoacoustic and photothermal deflection, are reviewed in the context of in situ ultrace detection of atmospheric constituents. DOE

**N83-17666#** Purdue Univ., Lafayette, Ind.

**MULTICOMPONENT DIFFUSION UNDER GENERAL-CHEMICAL-POTENTIAL GRADIENTS Progress Report, 1 Jul. 1981 - 31 Jan. 1982**

H. Sato and R. Kikuchi 1982 13 p refs

(Contract DE-AC02-81ER-10913)

(DE82-008815; DOE/ER-10913/1) Avail: NTIS HC A02/MF A01

The derivation of the Onsager equation for diffusion under general chemical potential gradients for three component systems was re-examined and corrected suitably for application. The corrections include extension of the ensemble averaging method in deriving material transport of the original Path Probability Method (PPM) to include the time averaging and generalization of the concept of the correlation factor for isotope diffusion to experiments in multicomponent systems. The formulation for chemical diffusion in a multicomponent system under general chemical potential gradients was made based on the above background. Material transport under a temperature gradient (thermal diffusion) was formulated by the PPM for the first time. The formulation for the chemical potential maps of three components systems by the pair approximation of the Cluster Variation Method was made as a basis for the study of the diffusion path and zero flux planes. DOE

**N83-17667#** Brigham Young Univ., Provo, Utah. Dept. of Chemistry.

**SEPARATION OF ASPHALTENES USING HIGH-RESOLUTION SUPERCRITICAL FLUID CHROMATOGRAPHY Progress Report, 1 Dec. 1981 - 28 Feb. 1982**

W. P. Jackson, P. A. Peaden, J. C. Fjeldsted, and M. L. Lee 1982 18 p refs

(Contract DE-FG22-81PC-40809)

(DE82-008469; DOE/PC-40809/T2) Avail: NTIS HC A02/MF A01

During this period pressure programming techniques for the capillary supercritical fluid chromatography (SFC) were examined and applied to the analysis of polystyrene oligomer samples as well as polycyclic aromatic hydrocarbon (PAH) extracts from a carbon black sample. Crosslinking procedures for insoluble nonpolar stationary phases were evaluated to determine relative merits of various crosslinking agents and techniques. The second SFC instrument was constructed and interfaced to a microcomputer for control of the UV detector as well as for control of pressure programming. DOE

**N83-17668#** Oak Ridge National Lab., Tenn.

**EXPERIMENTAL TECHNIQUES FOR THE STUDY OF PHOTOSYNTHETIC WATER SPLITTING**

D. A. McWhirter, J. P. Eubanks, and E. Greenbaum 1981 10 p refs Presented at the Ann. Meeting of the Inst. of Chem. Engrs., New Orleans, 8-11 Nov. 1981

(Contract W-7405-eng-26)

(DE82-003974; CONF-811108-8) Avail: NTIS HC A02/MF A01

A novel experimental apparatus will be presented which is used for the study of biological solar energy conversion. This method utilizes the photosynthetic splitting of water to produce molecular hydrogen and molecular oxygen. Two oxygen sensors will be described. The first is the Burr-Mauzerall oxygen luminometer. The second sensor is a modified Hersch electrogalvanic cell. The hydrogen sensor is a zirconium oxide high temperature fuel cell. Both sensors are arranged in tandem in a continuous flow stream. Techniques of measuring and calibration will be reported. DOE

**N83-17669#** Midwest Research Inst., Kansas City, Mo.

**INVESTIGATION OF THE FUNDAMENTAL KINETICS IN PULVERIZED-COAL COMBUSTION Quarterly Technical Progress Report, 9 Sep. - 31 Dec. 1981**

Frank T. Greene Jan. 1982 25 p refs

(Contract DE-AC22-81PC-40274)

(DE82-010375; DOE/PC-40274/T1; QTPR-1) Avail: NTIS HC A02/MF A01

Apparatus for both the single particle experiments and the laminar flame studies was set up, tested, and various improvements and modifications made. Preliminary single particle experiments were carried out, and gaseous species identified. A literature search and an examination of existing pulverized coal combustion models were carried out, and work on the development of a new model begun. The objective is the determination of the kinetics of the reactions of individual coal particles during pulverized coal combustion. Two complementary experimental systems are used: the laser pyrolysis/combustion of single coal particles and premixed laminar coal dust-air flames. The combustion intermediates and products are identified and their concentrations measured using molecular beam mass spectrometric and optical spectrophotometric techniques. Temperature, time resolved schlieren, total radiation and other measurements are made as needed to characterize the combustion processes. DOE

**N83-17670#** Wisconsin Univ., Madison. Alternative Fuels Utilization Program.

**FUEL-COMPOSITION AND -VAPORIZATION EFFECTS ON COMBUSTION-CHAMBER DEPOSITS**

P. S. Meyers, O. A. Uyehara, and R. DeYoung Dec. 1981 143 p refs

(Contract DE-FG01-79CS-50020)

(DE82-012576; DOE/CS-50020/1) Avail: NTIS HC A07/MF A01

It is known that gasoline extracted from coal and shale oil sources has higher end point fraction and higher aromatic content (hereafter known as HEPHAG) than typical normal end point gasoline (NEPG). Further, it is known that these HEPHAG can cause objectionable combustion chamber deposits (CCD). It was

of practical interest (and the purpose of this thesis) to investigate whether HEPHAG would give acceptable combustion chamber deposits (i.e. comparable to NEPG) if introduced into a S.I. engine in a vaporized and homogeneous (gas phase) form. An analysis of the single cylinder results showed that regardless of the fuel, CCD decreased significantly when the fuel-air charge conditions were judged to be primarily gas phase. However, HEPHAG required a higher fuel-air charge temperature (FACT) than NEPG to realize this gas phase condition. An analysis of the multicylinder results showed that the vortex helped approach an equilibrium condition. Also, under conditions of high FACT and using the vortex, there was little difference in CCD formation between HEPHAG and NEPG tests. DOE

**N83-17671#** Battelle Columbus Labs., Ohio.
**PROGRAM ON THE COMBUSTION CHEMISTRY OF LOW- AND INTERMEDIATE-Btu GAS MIXTURES**
Arthur Levy, Abbott A. Putnam, Herbert A. Arbib, David A. Ball, E. Lewis Merryman, John R. Overley, E. Radahakrishnan, and Bruce W. Rising 30 Nov. 1981 87 p refs
(Contract DE-AC22-76ET-10653)
(DE82-010783; DOE/ET-10653/5) Avail: NTIS HC A05/MF A01

Low and intermediate Btu (LBTU and IBTU) gas mixtures are essentially mixtures of CO, H2 and CH4 diluted with nitrogen and CO2. Although the combustion properties of these three fuels have been extensively investigated and their individual combustion kinetics are reasonably well established, prediction techniques for applying these gas mixtures remain for the most part empirical. This program has aimed to bring together and apply some of the fundamental combustion parameters to the CO-H2-CH4 flame system with the hope of reducing some of this empiricism. Four topical reports have resulted from this program. This final report summarizes these reports and other activities undertaken in this program. DOE

**N83-17672#** Institute of Gas Technology, Chicago, Ill.
**COMBUSTION CHARACTERISTICS OF FINE-GROUND COAL: PROJECT 61052 Quarterly Technical Report, 1 Jun. - 31 Aug. 1981**
Mar. 1982 23 p
(Contract DE-AC22-81PC-40269)
(DE82-009958; DOE/PC-40269/6) Avail: NTIS HC A02/MF A01

This program consists of a research study to investigate the effect of coal particle size on the flame characteristics of pulverized coal. The purpose is to determine if fine grinding will allow replacement of oil by coal in some industrial applications. The Plant Engineering Development Department of General Motors Corporation (GM) and the Research and Development Staff of York-Shipley, Inc. (Y-S), a major boiler manufacturer, are assisting IGT in this effort. Pulverized coal will be fired at about 2 million Btu/h (approximately 160 lb/h) in a special experimental furnace designed to collect data on the combustion and heat-transfer characteristics of flames. Combustion trials with No. 6 oil are also planned to allow for direct correlation with the coal combustion data. Some of the information to be obtained from this study will be a determination of how the flame heat release density, mass burning rate, flame temperatures, and heat-transfer characteristics change with fuel particle size (fineness of coal grinding). DOE

**N83-17673#** Exxon Research and Engineering Co., Florham Park, N.J.
**EDS COAL-LIQUEFACTION PROCESS DEVELOPMENT. PHASE 5: EDS ENVIRONMENTAL PROGRAM Interim Report**
Nov. 1981 89 p ref Sponsored in part by Exxon Co., Electric Power Research Inst., Japan Coal Liquefaction Development Co., Phillips Coal Co., ARCO Coal Co., Ruhrkohle AG, and Agip, S.p.A.
(Contract DE-FC01-77ET-10069)
(DE82-005641; DOE/ET-10069/T11; FE-2893-79) Avail: NTIS HC A05/MF A01

This report describes the environmental activities being conducted to support the commercialization of the Exxon Donor Solvent Process (EDS). The EDS process involves the noncatalytic hydroliquefaction of coal at operating conditions of approximately 800 F and 2000 psia to produce a product slate of coal derived hydrocarbon liquids and gases compatible with current uses of natural petroleum. While there are no absolute environmental barriers to the successful commercialization of the EDS process under existing Environmental Protection Agency (EPA). Occupational Safety and Health Administration (OSHA) or other agency regulations, concerns do exist which include health and safety implications of uncharacterized process materials and emissions, potential environmental impact of product combustion, and safe disposal of uncharacterized solid wastes. These health/environmental concerns are being addressed within the EDS project for those materials which represent components of the EDS process development. DOE

**N83-17674#** Pittsburgh and Midway Coal Mining Co., Englewood, Colo.
**SOLVENT REFINED COAL (SRC) PROCESS. EVALUATION OF BUTANE SCRUBBING FOR REMOVAL OF HYDROCARBONS FROM SRC-2 PROCESS RECYCLE GAS. EXPERIMENTAL PROGRAM ON PDU P-99. VOLUME 6: PROCESS DEVELOPMENT UNIT WORK. PART 3: ENGINEERING STUDIES Interim Report, Mar. - Jul. 1981**
S. T. Mathias Jan. 1982 190 p refs
(Contract DE-AC05-76ET-10104)
(DE82-007664; DOE/ET-10104/27; RDR-53; IR-50) Avail: NTIS HC A09/MF A01

This report presents the results of 18 tests on the butane wash system of Process Development Unit P-99 performed during Runs P99-82 and -83 feeding Powhatan No. 6 Mine coal and during Run P99-85 processing Ireland Mine coal. The objective of this experimental program was to investigate butane as an absorbing liquid for removing pentanes and heavier hydrocarbons from hydrogen rich SRC-2 recycle gas. This experimental data was gathered to assist in determining the feasibility of implementing this system on the SRC-2 Demonstration Plant, as a means of reducing heavy hydrocarbons in the feed to the cryogenic unit to an acceptable level (200 ppM C sub 5(+)). Operating conditions were identified which achieved essentially a complete removal of the C sub 5(+) components from the recycle gas on PDU P-99. Detailed component analyses for individual hydrocarbons and fixed gases were determined for all inlet and outlet streams. Correlations were developed which adequately fit the experimental data; however, these correlations reveal inconsistencies and indicate the need for more extensive tests. DOE

**N83-17675#** Pittsburgh and Midway Coal Mining Co., Englewood, Colo.
**SOLVENT-REFINED-COAL (SRC) PROCESS. AXIAL DISPERSION IN TALL BUBBLE COLUMNS. TRACER TESTS. VOLUME 5: RESEARCH AND DEVELOPMENT TECHNICAL SUPPORT PROGRAM. PART 4: SOLIDS WITHDRAWAL STUDIES Interim Report**
K. Parimi and M. D. Pitchford Jan. 1982 52 p
(Contract DE-AC05-76ET-10104)
(DE82-006944; DOE/ET-10104/40; RDR-53; IR-57) Avail: NTIS HC A04/MF A01

Several qualitative tests were conducted on the 25 ft plexiglass bubble column in order to visually observe the axial dispersion or backmixing characteristics of a column of this size. A concentrated solution of Methyl-Orange was injected, and the dispersion of the dye throughout the column was observed and photographed. These observations indicated that the backmixing level was not as extensive as existing correlations would predict. Since backmixing plays an important role in the design and scale-up of solvent refined coal-2 reactors, it was decided to follow up with additional quantitative tests for further elucidation of this aspect of bubble column performance. The required test apparatue was assembled and tracer tests using an electrolytic tracer in the form of a 10 N NaOH solution were conducted. The results confirmed the visual observations; that the degree of backmixing was less than existing literature correlations predicted. DOE

**N83-17676#** Exxon Research and Engineering Co., Bayton, Tex.
**CATALYTIC COAL GASIFICATION: AN EMERGING TECHNOLOGY FOR SNG**
R. R. Lessard and R. A. Reitz 1981 26 p refs
(Contract DE-AC01-78ET-13005)
(DE82-007596; DOE/ET-13005/T13) Avail: NTIS HC A03/MF A01

It was found that potassium salts added to coal promotes the methanation of coal gasification products. This discovery led to Exxon's catalytic coal gasification (CCG) process. In the CCG process, coal with added potassium salts is gasified in a fluid bed at about 1300 F and 500 psia. Since lower temperatures and higher pressure favor methane formation, the gasification reactor has a high methane yield. By separating and recycling unconverted CO and H2 back to the reactor, a single reaction step process is obtained. An advantage of CCG is that the heat release from methanation is in the gasifier where it provides essentially all of the heat needed for gasification. This eliminates the need for oxygen or other complex gasifier heat input methods. Thermal efficiency of CCG ranges from 60 to 70% depending on coal feed properties. Process development work was carried out in bench scale equipment and pilot plants. DOE

**N83-17677#** Colorado School of Mines, Golden. Dept. of Chemical and Petroleum Refining Engineering.
**MECHANISMS AND KINETICS OF COAL HYDROGENATION Quarterly Progress Report, Oct. - Dec. 1981**
R. M. Baldwin Mar. 1982 62 p refs
(Contract DE-AC22-79ET-14881)
(DE82-012338; DOE/ET-14881/8) Avail: NTIS HC A04/MF A01

Data for coal hydrogenation in the presence of added H2S, pyrite, and H2S plus pyrite are given along with baseline data for hydrogenation without the use of additives. What is perhaps most striking about these data is the influence of added H2S in absence of added pyrite. The percentage of H2S refer to the mole percentage of H2S in the gas atmosphere prior to heating and reaction (cold composition). A 56% increase in overall conversion is indicated at the 10 minute residence time, with a 21% increase at 60 minutes when gaseous H2S alone is added to the reaction gas atmosphere. The predominate influence on product distribution is in the preasphaltene fraction, especially at the short residence time. Clearly, H2S is acting as a catalyst for coal liquefaction at these conditions. Concentrations above 2% H2S in the initial gas phase mixture do not seem to appreciably increase the conversion; the effect noted at 60 minutes between 5% and 10% may not be significant due to scatter in the data. DOE

**N83-17678#** McKee (Davy) Corp., Cleveland, Ohio.
**DEVELOPMENT OF STANDARDS AND A COST MODEL FOR COAL AGGLOMERATION AND RELATED STUDIES**
S. G. Nelson, O. A. Kuby, F. A. Korosi, and M. O. Paulin 26 Feb. 1982 43 p refs
(Contract DE-AC01-81FE-05147)
(DE82-011047; DOE/FE-05147/T2) Avail: NTIS HC A03/MF A01

Several topics concerning coal agglomeration and fixed-bed coal gasification, as they relate to an agglomeration-process development program are discussed. Specific topics include an examination of the performance of coals in fixed-bed gasifers, the development of properties' standards by which agglomerates produced in the program may be compared, the development of a cost model to judge the economic feasibility of coal agglomeration for potential users and the maximum binder levels to be considered in the program, the definition of a suitable briquette size for coal gasification, and a study of upgrading methods at the mines to improve agglomeration. Extensive property data and the results of a number of special tests on six coals (Pittsburgh No. 8 bituminous coal, Illinois No. 6 bituminous coal, Wyoming Bighorn subbituminous coal, Montana Rosebud No. 14 subbituminous coal, North Dakota Indian Head lignite and Pennsylvania Nanoth anthracite coal) and on FMC formcoke and Simplex briquettes are reported. DOE

# 26 METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

**N83-17679** Department of Industry, London (England).
**CORROSION PRINCIPLES FOR ENGINEERING TECHNICIANS**
B. Perry 1982 38 p
Copyright. Avail: Issuing Activity

Both wet and dry corrosion are discussed. Corrosion prevention and resistance are discussed. Protective coatings, electroplating, and cladding are among the topics discussed. Various metals are discussed. R.J.F.

**N83-17680** National Physical Lab., Teddington (England). Div. of Materials Applications.
**CALCULATED PHASE EQUILIBRIA FOR THE Cu-Fe-Ni SYSTEM**
T. G. Chart, D. D. Gohil, and Zhong-shu Xing (Acad. Sinica) Aug. 1982 37 p refs
(NPL-DMA(A)-54; ISSN-0143-7314) Copyright. Avail: Issuing Activity

Phase equilibria for the ternary system Cu-Fe-Ni were calculated from thermodynamic data, primarily those for the three binary systems involved. Published experimental ternary phase diagram data were critically assessed and incorporated into the thermodynamic parameters to provide an optimized set of isothermal sections that is consistent with the totality of available experimental thermodynamic and phase diagram information. Seventeen ternary isothermal sections were produced for temperatures in the range 673 to 1673 K. S.L.

**N83-17681*#** California Inst. of Tech., Pasadena. Div. of Physics, Mathematics, and Astronomy.
**RESEARCH ON PLANETARY SAMPLES Final Report, 1 Mar. - 30 Sep. 1982**
T. A. Tombrello 30 Sep. 1982 17 p
(Grant NAGw-148)
(NASA-CR-169839; NAS 1.26:169839) Avail: NTIS HC A02/MF A01 CSCL 11F

Sputtering yields of solid SO2 by high energy ions were measured in order to study the mechanism for sputtering dielectrics with ions in the electronic stopping power region. The incident ions were helium and fluorine with energies ranging from 1.5 MeV to 25 MeV. Yields as high as 7000 SO2 molecules/incident F ion were measured; the 1.5 MeV He4 beam had a sputtering yield of 50. The data are compared to yield measurements made on UF4 and H2O targets. There is a striking similarity in the yield as a function of the Energy for all three targets. The data compare favorably with theoretical curves based on a model for the sputtering which considers the electronic excitations induced the target by the incident beam. Measurements and calculations of the sort are also useful in understanding processes which occur on the surface of Jupiter's satellite Io, which is covered with SO2 frost and bombarded by energetic ions trapped in the Jovian magnetosphere. S.L.

**N83-17682*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
**SURFACE PROFILE CHANGES OF SCUFFED BEARING SURFACES**
James L. Lauer (Rensselaer Polytechnic Inst.), Simon S. Fung (Rensselaer Polytechnic Inst.), and William R. Jones, Jr. 1982 15 p refs Presented at the Israel Conf. on Mech. Eng., Haifa, Israel, 13-14 Jul. 1982
(Grants NsG-3170; AF-AFOSR-005-81)
(NASA-TM-83055; E-1402; NAS 1.15:83055) Avail: NTIS HC A02/MF A01 CSCL 11F

A phase locked interference microscope capable of resolving depth differences to 30 A and planar displacements of 6000 A was constructed for the examination of the profiles of bearing surfaces without physical contact. This instrument was used to determine surface chemical reactivity by applying a drop of dilute

alcoholic hydrochloric acid and measuring the profile of the solid surface before and after application of this probe. Scuffed bearing surfaces reacted much faster than unscuffed ones, but bearing surfaces which had been previously exposed to lubricants containing an organic chloride reacted much more slowly. In a separate series of experiments, a number of stainless steel plates were heated in a nitrogen atmosphere to different temperatures and their reactivity examined later at room temperature. The change of surface contour as a result of the probe reaction followed an Arrhenius type relation with respect to heat treatment temperature. This result could have implications on the scuffing mechanism.
Author

**N83-17683*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
**COATING WITH OVERLAY METALLIC-CERMET ALLOY SYSTEMS Patent Application**
Michael A. Gedwill, Stanley R. Levine, and Thomas K. Glasgow, inventors (to NASA) Filed 7 Jan. 1983 12 p
(NASA-Case-LEW-13639-2; US-Patent-Appl-SN-456460) Avail: NTIS HC A02/MF A01 CSCL 11F

A base layer of an oxide dispersed, metallic alloy (cermet) is arc plasma sprayed onto a substrate, such as a turbine blade, vane, or the like, which is subjected to high temperature use. A top layer of an oxidation, hot corrosion, erosion resistant alloy of nickel, cobalt, or iron is then arc plasma sprayed onto the base layer. A heat treatment is used to improve the bonding. The base layer serves as an inhibitor to interdiffusion between the protective top layer and the substrate. Otherwise, the 10 protective top layer would rapidly interact detrimentally with the substrate and degrade by spalling of the protective oxides formed on the outer surface at elevated temperatures.
NASA

**N83-17684#** National Aerospace Lab., Amsterdam (Netherlands). Structures and Materials Div.
**THE INFLUENCE OF DIFFERENT ENVIRONMENTS ON STRESS CORROSION CRACKING OF HIGH STRENGTH ALUMINUM ALLOY FORGINGS**
L. Schra and R. J. H. Wanhill Jan. 1982 16 p refs Submitted for publication Sponsored by Netherlands Agency for Aerospace Programs (NIVR)
(NLR-MP-82005-U) Avail: NTIS HC A02/MF A01

Several high strength aluminium alloy forgings were used to evaluate accelerated methods of stress corrosion testing from atmospheric exposure. The methods are: (1) alternate immersion or periodic moistening using 3.5 % aqueous NaCl or synthetic seawater, and (2) continuous immersion in 3.5 % aqueous NaCl with additions of Na2CrO4. For stress corrosion crack initiation testing the most suitable methods were alternate immersion of ground or polished specimens in synthetic seawater or 3.5 % aqueous NaCl and with an external environment of low humidity. It is found that the most suitable test methods are alternate immersion in synthetic seawater or 3.5 % aqueous NaCl, or periodic moistening with 3.5 % aqueous NaCl for stress corrosion crack propagation.
E.A.K.

**N83-17685#** Research Inst. of National Defence, Stockholm (Sweden). Dept. 2.
**PLASTICITY OF METALS. STRESS, STRAIN AND STRUCTURE**
Torbjoern Svensson Sep. 1982 24 p refs In ENGLISH; SWEDISH summary
(FOA-C-20467-D4) Avail: NTIS HC A02/MF A01

Some aspects concerning dislocation generation and its influence on material strength are briefly reviewed. Emphasis is given to the development of cell structures at different ranges and states of strain. The coupling between cell dimensions and mean free path of mobile dislocations is discussed and some methods are outlined to estimate the mean free path which is of the highest importance for generating new dislocations. Analysis of data from a wide range of strain shows that the cell dimensions are functions of both material and geometry factors.
Author

**N83-17686#** Bosch (Robert) G.m.b.H., Gerlingen (West Germany). Technisches Zentrum Forschung.
**DEVELOPMENTS AND APPLICATIONS OF TANTALUM THIN FILMS AND HYBRID TECHNOLOGY Final Report, Sep. 1977**
Guenter Krueger Bonn Bundesministerium fuer Forschung und Technologie Oct. 1982 349 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-82-173; ISSN-0340-7608) Avail: NTIS HC A15/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 51,50

The effects of technology development in the fields of thin films, etching and trimming techniques, and the processes for assembling of hybrid blocks are discussed. The processes have been cheapened by using less expensive materials, and at the same time safety and economy of fabrication have been secured. The reliability and flexibility attained are sufficient for technological and electronic requirements.
E.A.K.

**N83-17687#** Northwestern Univ., Evanston, Ill. Dept. of Materials Science.
**A STUDY OF THE ROLE OF GRAIN BOUNDARY CAVITATION IN THE CREEP-FATIGUE INTERACTION IN HIGH TEMPERATURE FATIQUE Final Technical Report, 1 Apr. 1977 - 31 Mar. 1982**
Julia R. Weertman 20 Sep. 1982 74 p refs
(Grant AF-AFOSR-3251-77; AF Proj. 1206)
(AD-A121231; AFOSR-82-0914TR) Avail: NTIS HC A04/MF A01 CSCL 11/6

An investigation has been carried out of the processes involved in the nucleation of grain boundary cavities in astroloy. Cavitation was produced by several methods: room temperature straining, straining and annealing, high temperature creep of prestrained astroloy, creep of non-prestrained material. It is concluded from the experimental evidence that the same mechanism is responsible for the initial grain boundary damage in all cases. In astroloy pulled at room temperature, damage shows up as microcracks at the interface pulled at room temperature, damage shows up as microcracks at the interface between carbide and matrix. It is isotropic. During annealing, large residual stresses in the strained material close up cracks on some boundaries, increase and round out the cracks on other boundaries so that damage now appears in the form of voids. Residual stresses have a large effect on the creep life of prestrained astroloy. Their influence can persist over a significant fraction of the creep life. Residual stresses are found to be important even in the creep of non-prestrained astroloy. The density of voids in non-prestrained astroloy seems to be determined by total creep strain; it is independent of creep stress, at least over the range of test conditions studied. A small strain appears to be necessary for the onset of creep cavitation. All of the results noted above can be explained qualitatively on the basis of the stress fields which build up during deformation around non-deforming inclusions whose elastic constants differ from those of the matrix.
GRA

**N83-17688#** Wayne State Univ., Detroit, Mich. Dept. of Physics and Astronomy.
**SCANNING PHOTOACOUSTIC MICROSCOPY OF ALUMINUM WITH ALUMINUM OXIDE, ROUGHNESS STANDARDS AND RUBBER Interim Report, Jun. 1981 - 1982**
R. L. Thomas, L. D. Favro, P. K. Kuo, and Douglas N. Rose (Army Tank Automotive Command) Warren Army Tank Automotive Command Jul. 1982 40 p refs
(Contract DAAE07-81-C-4049)
(AD-A121591; TACOM-TR-12668) Avail: NTIS HC A03/MF A01 CSCL 07/4

Scanning Photoacoustic Microscopy (SPAM) images of aluminum with 0%, 24%, and 36% aluminum oxide grit, of surface roughness standards, and of track shoe pad rubber are shown. Considerable structure is evident in the images, even in the supposedly uniform sample of aluminum with 0% grit. Further research is necessary to relate the structure evident in the images

which cannot be correlated with visible features to properties of the materials. Author (GRA)

**N83-17689#** Iowa State Univ. of Science and Technology, Ames. Dept. of Material Science and Engineering.
**THE EFFECT OF YTTRIUM ADDITIONS ON THE TENSILE PROPERTIES AND HARDNESS OF AN IRON-NICKEL-CHROMIUM ALLOY M. S. Thesis**
Mohammed Zafar Shah-Khan Oct. 1981 79 p refs
(Contract W-7405-eng-82)
(DE82-005549; IS-T-975) Avail: NTIS HC A05/MF A01

Results of the research show that the addition of 0.1% yttrium does not significantly change the mechanical properties of the AL1 alloy with temperature (even though the yttrium-doped samples did show a slight increase in yield stress and hardness for tests above 700 C); the room temperature strength of the undoped AL1 alloy increases upon annealing at temperatures above 600 C; and the room temperature uniform and fracture strains of the undoped AL1 alloy decrease upon annealing at temperatures above 600 C. DOE

**N83-17690#** Massachusetts Inst. of Tech., Cambridge. Dept. of Materials Science and Engineering.
**THE MICROSTRUCTURE OF RAPIDLY SOLIDIFIED PATH A PRIME-CANDIDATE ALLOYS FOLLOWING IRRADIATION WITH Fe AND He IONS**
L. Arnberg, J. B. VanderSande, H. J. Frost, and O. K. Harling 1981 5 p refs Presented at the Fusion Reactor Mater. Meeting, Seattle, 9 Aug. 1981
(Contract DE-AS02-78ER-10107)
(DE82-006756; DOE/ER-10107/7; CONF-810831-76) Avail: NTIS HC A02/MF A01

A rapidly solidified, titanium modified, cold worked Type 316 stainless steel was irradiated simultaneously with Fe and He ions at temperatures between 450 and 650 C. The material shows no void swelling at 450 C even at 50 dpa. At 550 C the swelling is very low below 40 dpa but increases with fluence to 0.4% at 60 dpa. At 650 C both the cavity number density and size increase to give a swelling of 0.8% at 40 dpa. A conventionally ingot cast alloy with the same composition shows comparable swelling but the void number density in this material is significantly higher. Small (< 200 A) TiC particles which were originally present in the rapidly solidified material are dissolved at fluences above 40 dpa at all temperatures. A silicon and nickel rich phase precipitated during irradiations at 550 and 650 C. DOE

**N83-17691#** Atomic Energy Research Establishment, Harwell (England). Theoretical Physics Div.
**CALCULATIONS OF THE REFLECTION AND TRANSMISSION OF ULTRASOUND BY ROUGH SODIUM-FILLED DEFECTS IN STEEL**
J. A. G. Temple Jul. 1981 56 p refs
(DE82-901337; AERE-R-10095) Avail: NTIS (US Sales Only) HC A04/MF A01; DOE Depository Libraries

The reflection and transmission coefficients of rough planar defects for ultrasonic elastic waves were determined. Results are presented for 2.25 MHz waves of all three independent polarizations (often denoted P, SV, and SH waves). The roughness is treated as a perturbation, to first order in the root mean square height, from the exactly soluble case of a flat and parallel sided slot. The theory and results presented are valid for the case where the two sides of the defect are separated by much more than the root mean square roughness and the defect contains a solid or a liquid. A typical result is that for a 20 micron separation of the defect faces, each of which has a 10 micron rms roughness, then the P wave reflection coefficient at 2.25 MH/sub z/ is reduced by 20% from its value calculated for smooth, flat and parallel faces, even at normal incidence. DOE

**N83-17692#** Pacific Northwest Lab., Richland, Wash.
**ASSESSMENT OF STRESS-CORROSION CRACKING IN A SPENT-FUEL POOL PIPE**
R. H. Jones, A. B. Johnson, Jr., and F. Scott Giacobbe (GPU Service Corp.) 1981 27 p refs Presented at the Intern. Corrosion Forum, Toronto, 6-10 Apr. 1981; sponsored by the Natl. Assoc. of Corrosion Engr.
(Contract DE-AC06-76RL-01830)
(DE82-010966; PNL-SA-8995; CONF-810402-13) Avail: NTIS HC A03/MF A01

Intergranular stress corrosion cracks (IGSCC) found in the weld heat affected zone of pipe in the Spent Fuel Pool piping system at Three Mile Island Unit No. 1 have been evaluated by a series of analytical tests. The intergranular nature of the cracks was identified by optical metallography and scanning electron microscopy. The presence of Cl- was observed by Energy Dispersive X-Ray Analysis and Auger Electron Spectroscopy. Sulfur was observed both as particles and uniformly on the fracture surface. Constant extension rate tests performed on specimens removed from the pipe and containing the weld HAZ demonstrated that 15 ppM Cl- in a 1.3 wt % H3BO3 solution was sufficient to cause IGSCC when the original pipe surface was present. Removal of this surface resulted in 100% ductile (microvoid coalescence type) fracture for the same test condition. The association of cracks with grinding marks and surface defects in the as-received pipe also supports the conclusion that surface defects contributed to crack initiation. DOE

**N83-17693#** Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.
**TEMPERATURE ESTIMATES FROM THE ZIRCALOY OXIDATION KINETICS IN THE ALPHA PLUS BETA PHASE REGION**
C. S. Olsen 1981 17 p refs Presented at the 6th Intern. Conf. on Structural Mech. in Reactor Technol., Paris, 17 Aug. 1981
(Contract DE-AC07-76ID-01570)
(DE82-005952; CONF-810801-61) Avail: NTIS HC A02/MF A01

Oxidation rates of zircaloy in steam were measured at temperatures between 961 and 1264 K and for duration times between 25 and 1900 seconds in order to calculate, in conjunction with measurements from postirradiation metallographic examination, the prior peak temperatures of zircaloy fuel rod cladding. These temperature estimates will be used in light water reactor research programs to assess (a) the accuracy of temperature measurements of fuel rod cladding peak temperatures from thermocouples attached to the surface during loss-of-coolant experiments (LOCEs), (b) the perturbation of the fuel rod cladding LOCE temperature history caused by the presence of thermocouples, and (c) the measurements of cladding azimuthal temperature gradients near thermocouple locations. DOE

**N83-17694#** Oak Ridge National Lab., Tenn. Solid State Div.
**MULTILAYER RELAXATION IN METALLIC SURFACES AS DEMONSTRATED BY LEED ANALYSIS**
H. L. Davis and J. R. Noonan Jul. 1982 16 p refs Presented at a Conf.
(Contract W-7405-eng-26)
(DE82-020892; CONF-820869-1-Draft) Avail: NTIS HC A02/MF A01

Theoretical motivations are reviewed for investigation of multilayer relaxation in relatively simple metallic surfaces. Results from LEED analyses are presented which serve to demonstrate that multilayer relaxation measurably exists in Cu(100) and Cu(110) surfaces. The results from two independent LEED analyses for Cu(110) are shown to be in much better agreement with each other than the LEED results are with multilayer relaxation results obtained by high energy ion scattering. Multilayer relaxation results for other metallic surfaces also are reviewed briefly, and all available results are discussed in relationship to those obtained by a theoretical, model type, inquiry of Landman, Hill and Mostoller. DOE

**N83-17695#** Rockwell International Corp., Golden, Colo. Energy Systems Group.
**VACUUM DISTILLATION OF AMERICIUM METAL**
James W. Berry, James B. Knighton, and Chalmers A. Nannie 22 Jan. 1982 19 p refs
(Contract DE-AC04-76DP-03533)

(DE82-010652; RFP-3211) Avail: NTIS HC A02/MF A01

High purity americium metal was distilled in multigram quantities from a plutonium americium alloy. The procedure consisted of a two stage vacuum distillation carried out at 1200 C and .000001 torr pressure. Four batches of americium metal were produced ranging in weight from 13.3 grams to 54.1 grams. The purity of the americium product ranged from 99.27% to 99.79%. DOE

**N83-17696#** Bendix Corp., Kansas City, Mo.
**A THIN-FILM-NETWORK TEST PATTERN FOR USE WITH ELECTROPLATED GOLD**
R. A. Hines Nov. 1981 19 p refs Presented at the Am. Electroplaters Soc. 9th Plating in Electron. Ind. Symp., Atlanta, 16 Feb. 1981
(Contract DE-AC04-76DP-00613)
(DE82-010728; BDX-613-2712; CONF-820214-1) Avail: NTIS HC A02/MF A01

A test pattern was developed to monitor the quality of pattern electroplated gold thin film networks. A Ti/Pd pattern electroplated Au metallization system is replacing a current evaporated Cr/Au system. The monitor retains the most useful features of its predecessor and adds several additional patterns for the electrical measurement of resolution, gold thickness, and conductor width. Each 0.25 by 1 in. monitor contains standard and checkerboard thermal compression lead frame bond pads and 18 electrical test patterns. Pattern electroplating was used to make a conductor for 4 point resistance measurements on the monitor and a microcomputer based tester is being assembled to measure and reduce the resistance data. DOE

**N83-17697#** Brookhaven National Lab., Upton, N. Y. Dept. of Energy and Environment.
**INITIAL STAGES OF HIGH TEMPERATURE METAL OXIDATION**
Chiang Y. Yang and William E. O'Grady 1981 23 p refs Presented at the Am. Vacuum Soc. Natl. Symp., Anaheim, Calif., 3 Nov. 1981 Submitted for publication
(Contract DE-AC02-76CH-00016)
(DE82-010618; BNL-30755; CONF-811113-50) Avail: NTIS HC A02/MF A01

The application of XPS and UPS to the study of the initial stages of high temperature (> 350 C) electrochemical oxidation of iron and nickel is discussed. In the high temperature experiments, iron and nickel electrodes were electrochemically oxidized in contact with a solid oxide electrolyte in the uhv system. The great advantages of this technique are that the oxygen activity at the interface may be precisely controlled and the ability to run the reactions in uhv allows the simultaneous observation of the reactions by XPS. DOE

**N83-17698#** Oak Ridge National Lab., Tenn.
**MULTIAXIAL FATIGUE CRITERIA FOR AISI 304 AND 2-1/4 Cr-1 Mo STEEL AT 538 DEG C WITH APPLICATIONS TO STRAIN-RANGE PARTITIONING AND LINEAR SUMMATION OF CREEP AND FATIGUE DAMAGE**
J. J. Blass 1982 33 p refs Presented at the DOE/PNC Specialists' Meeting on Struct. Mater. Data, Tokyo, 25 Jan. 1982
(Contract W-7405-eng-26)
(DE82-010195; CONF-820121-1) Avail: NTIS HC A03/MF A01

An improved multiaxial fatigue failure criterion was developed based on the results of combined axial-torsional strain cycling tests of AISI 304 and 2-1/4 Cr-1 Mo steel conducted at 538 C (1000 F). The formulation of this criterion involves the shear and normal components of inelastic strain range on the planes of maximum inelastic shear strain range. Optimum values of certain parameters contained in the formulation were obtained for each material by the method of least squares. The ability of this criterion to correlate the test results was compared with that of the usual (Mises) equivalent inelastic strain range criterion. An improved definition of equivalent inelastic strain range resulting from these considerations was used to generalize the theory of Strain Range Partitioning to multiaxial stress-strain conditions and was also applied to the linear summation of creep and fatigue damage. DOE

**N83-17699#** California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
**EFFECT OF SURFACE DOPING ON THE OXIDATION OF Cr2O3 FORMING ALLOYS**
M. Landkof, D. H. Boone, D. P. Whittle, and A. V. Levy Dec. 1981 27 p refs Presented at the Natl. Assoc. of Corrosion Engr. Conf., Houston, Tex., 22-26 Mar. 1982
(Contract W-7405-eng-48)
(DE82-010318; LBL-11127; CONF-820314-3) Avail: NTIS HC A03/MF A01

The influence of the surface application of active elements (doping) on the composition, morphology, adherence and the growth rate of oxide scales formed during high temperature exposure was investigated. The active elements were applied as an aqueous solution of nitrate salts which were subsequently thermally decomposed to the oxide. Y, Ce, La, Hf, Ca and Zr were used as the active elements on 304 and 310 stainless steels. The application of the dopants on the surface was found to enhance the oxidation resistance of the alloy in the case of Y, Ce, La additions while no benefits were found for alloys doped with Hf, Ca and Zr. The possible reasons for these variations in behavior are discussed. DOE

**N83-17700#** Rockwell International Corp., Golden, Colo.
**CONDITIONS FOR PREPARATION OF ULTRAPURE BERYLLIUM BY ELECTROLYTIC REFINING IN MOLTEN ALKALI-METAL CHLORIDES Ph.D. Thesis**
Hagen Wohlfarth Feb. 1982 91 p refs Transl. into ENGLISH of a German thesis, Stuttgart Univ., (West Germany), 1981
(Contract DE-AC04-76DP-03533)
(DE82-011113; RFP-Trans-315) Avail: NTIS HC A05/MF A01

Electrolytic refining is regarded as the most suitable process for the production of beryllium with impurity contents below 1 at.-ppM. Several parameters are important for electrolytic refining of beryllium in a BeCl2-containing LiCl-KCl melt: current density, BeCl2 content, electrolyte temperature, composition of the unpurified beryllium and impurity-ion concentrations in the melt, as well as apparatus characteristics such as rotation speed of the cathode and condition of the crucible material. These factors were studied and optimized such that extensive removal of the maximum number of accompanying and alloying elements was achieved. DOE

**N83-17701#** State Univ. of New York, Stony Brook.
**RHEED, AES AND XPS STUDIES OF THE PASSIVE FILMS FORMED ON ION IMPLANTED STAINLESS STEEL**
C. R. Clayton, K. G. K. Doss, Y. F. Wang, J. B. Warren (Brookhaven National Lab.), and G. K. Hubler (Naval Research Lab.) Dec. 1981 11 p refs Presented at the 1st Conf. on Surface Modification by Ion Implantation, Manchester, England, 20 Jul. 1981 Sponsored in part by the National Science Foundation
(Contracts DE-AC02-76CH-00016; N00014-77-C-0424)
(DE82-006940; BNL-30434; CONF-810784-1) Avail: NTIS HC A02/MF A01

P-implantation into 304 stainless steel (ss) was carried out, and an amorphous surface alloy was formed. Polarization studies in deaerated 1N $H_2SO_4$ + 2% NaCl showed that P-implantation improved both the general and localized corrosion resistance of 304 ss. A comparative study was carried out between the implanted and unimplanted steel to determine what influence P-implantation has upon the properties of the passive film formed 1N $H_2SO_4$. The influence of Cl ions on preformed passive films was also studied. RHEED, XPS and AES were used to evaluate the nature of the passive films formed in these studies. DOE

**N83-17702#** Oak Ridge National Lab., Tenn.
**COMPATIBILITY OF STAINLESS STEEL WITH Pb-17 AT % LI**
P. F. Tortorelli and J. H. DeVan 1982 17 p refs Presented at the Natl. Assoc. of Corrosion Engr. Conf., Houston, Tex., 22-26 Mar. 1982

(Contract W-7405-eng-26)
(DE82-008828; CONF-820314-6) Avail: NTIS HC A02/MF A01

The corrosion of type 316 stainless steel and Sandvik HT9 by static Pb-17 at. % Li between 300 and 500 C was studied. The resulting weight losses were significantly greater than those of these steels in lithium. The corrosive attack was very uniform, and the room-temperature tensile properties of the steels were unaffected by the exposure. The application of molten Pb-17 at. % Li as a tritium-breeding fluid in conjunction with ferrous alloys in a fusion reactor may be limited to 400 C or below. DOE

**N83-17703#** Mound Lab., Miamisburg, Ohio.
**JAHN-TELLER RESONANCE STATES IN THE Vb METAL HYDRIDES**
G. C. Abell 1982 5 p refs Presented at the Intern. Symp. on the Electron. Struct. and Properties of Hydrogen in Metals, Richmond, 4 Mar. 1982
(Contract DE-AC04-76DP-00053)
(DE82-008462; MLM-2904(OP); CONF-820325-3) Avail: NTIS HC A02/MF A01

A Hamiltonian with a localized Jahn-Teller electron-phonon interaction plus a band-coupling term belonging to a metal cluster state adjacent to interstitial hydrogen in the Vb metals is presented. It is shown that in a low-frequency approximation, this Hamiltonian is analogous to the Anderson Hamiltonian for magnetic impurities in metals. The role of hydrogen in triggering the Jahn-Teller instability is explained in the context of the Hartree-Fock solutions of the low-frequency hamiltonian, using a phase diagram in the Hartree-Fock parameter space. An elastic susceptibility expression is derived and compared with an observed elastic relaxation. The empirical connection of the Jahn-Teller distortion to the observed elastic dipole tensor is reconsidered. DOE

**N83-17704#** Pacific Northwest Lab., Richland, Wash.
**ELECTROLESS NICKEL AND ION-PLATED PROTECTIVE COATINGS FOR SILVERED GLASS MIRRORS**
M. A. Lind, D. A. Chaudiere, and T. L. Stewart 1982 19 p refs Presented at the SPIE Opt. Coatings for Energy Efficiency and Solar Appl. Conf., Los Angeles, 25 Jan. 1982 Sponsored in part by Solar Energy Research Inst.
(Contract DE-AC06-76RL-01830)
(DE82-008566; PNL-SA-10169; CONF-820107-9) Avail: NTIS HC A02/MF A01

Two methods of protecting second surface silvered glass mirrors from environmental degradation were evaluated. One method employed silver mirrors overcoated with Al, Ni, 304 stainless steel, Cr, and an Al/Cu alloy prepared by ion-plating. The other method used conventional wet process silver mirrors protected with a thin electroless nickel coating. These mirrors were compared with conventional paint backed silver/copper mirrors after exposure to elevated temperatures and water vapor. The electroless nickel mirrors showed consistently more resistance to these stresses than either the conventional or ion-plated mirrors suggesting that they may provide more durable field service. DOE

**N83-17705#** General Electric Co., Schenectady, N. Y. Corporate Research and Development Center.
**LOCAL ATOMIC AND ELECTRONIC STRUCTURE IN GLASSY METALLIC ALLOYS Final Report, 1 Mar. 1979 - 31 May 1982**
R. P. Messmer and J. Wong 1982 28 p refs
(Contract DE-AC02-79ER-10382)
(DE82-018278; DOE/ER-10382/3; GE/SRD-82-044) Avail: NTIS HC A03/MF A01

The first coordinated experimental theoretical effort to arrive at important local atomic and electronic structure information in glassy alloys are discussed. Significant experimental and theoretical developments took place which had an important impact on the approach to this problem. This is particularly true in the theoretical area where two important advances, the development of a general X(-) LCAO approach, and the development of a general and accurate effective potential approach for density functional methods, allowed researchers to construct a new computational capability which combines these two advances. The experimental and theoretical technical developments are explored. These developments changed initial perspectives regarding research on local atomic and electronic structure in glassy metallic alloys. A synopsis of accomplishments is given. DOE

**N83-17706#** Oak Ridge National Lab., Tenn. Metals and Ceramics Div.
**CREEP PROPERTIES OF FORGED 2219 T6 ALUMINUM ALLOY SHELL OF GENERAL-PURPOSE HEAT SOURCE-RADIOISOTOPE THERMOELECTRIC GENERATOR**
J. P. Hammond Dec. 1981 51 p refs
(Contract W-7405-eng-26)
(DE82-007474; ORNL/TM-8020) Avail: NTIS HC A04/MF A01

To determine acceptability of the shell construction material (2219 T6 aluminum forging) of the General Purpose Heat Source Radioisotope Thermoelectric Generator the following proof tests simulating service were performed: 600 h of testing at 270 C under 24.1 MPa stress followed by 10,000 h of storage at 177 C under 55.1 MPa, both on the ground; and 10,000 h of flight in space at 270 C under 34.4 Mpa stress. Additionally, systematic creep testing was performed at 177 and 260 C to establish creep design curves. The creep tests performed at 177 C revealed comparatively large amounts of primary creep followed by small amounts of secondary creep. The early creep is believed to be abetted by unstable substructures that are annealed out during testing at this temperature. The creep tests performed at 270 C showed normal primary creep followed by large amounts of secondary creep. Duplicate proof tests simulating the ground exposure conditions gave results that were in good agreement. DOE

**N83-17707#** Electric Power Research Inst., Palo Alto, Calif. Materials Support Group.
**SOME 2 1/4Cr-1 Mo STEELS FOR COAL-CONVERSION PRESSURE VESSELS**
R. Viswanathan and R. I. Jaffe Nov. 1981 35 p refs
(EPRI Proj. RP-559)
(DE82-901349; EPRI-RD-2143-SR) Avail: NTIS HC A03/MF A01

Pressure vessels for coal conversion processes are likely to be made of a 2 1/4 Cr-1 Mo steel, covered by American Standards for Testing Materials specification A387, class 2, grade 22. Under the projected operating conditions, degradation of the mechanical properties of the steel by temper embrittlement, hydrogen embrittlement and hydrogen attack is a major concern. The significance of these degradation mechanisms is reviewed in the light of recently generated experimental results. DOE

**N83-17708#** Oak Ridge National Lab., Tenn. Metals and Ceramics Div.
**RESULTS OF u-BEND STRESS-CORROSION-CRACKING SPECIMEN EXPOSURES IN COAL-LIQUEFACTION PILOT PLANTS**
V. B. Baylor, J. R. Keiser, M. D. Allen, M. Howell, and J. F. Newsome Apr. 1982 40 p refs
(Contract W-7405-eng-26)
(DE82-012889; ORNL/TM-8194) Avail: NTIS HC A03/MF A01

The application of austenitic stainless steels that are susceptible to stress corrosion cracking to coal gasification pilot plants is discussed. This cracking results from tensile stresses in combination with offensive agents such as polythionic acids, chlorides, and caustics. To screen candidate construction materials for resistance to stress corrosion cracking, racks of stressed U-bend specimens were exposed in welded and as-wrought conditions at four coal liquefaction pilot plants. The on-site test results from June 1980 through October 1981 for the two pilot plants and the H-Coal and Exxon coal liquefaction pilot plants are given. DOE

# 27 NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

**N83-17709** Department of Industry, London (England).
**HOT DIP COATINGS FOR ENGINEERING TECHNICIANS**
D. J. Ashby (City of Birmingham Polytech., Engl.) 1982 25 p refs
Copyright. Avail: Issuing Activity

Metallic coatings produced by hot dipping are discussed. Dipping processes are described in detail. Tinning, aluminizing, and galvanizing are discussed. Corrosion resistance and prevention are discussed. R.J.F.

**N83-17710*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
**MECHANICAL AND SPECTROSCOPIC PROPERTIES OF METAL-CONTAINING POLYIMIDES**
Larry T. Taylor and Anne K. St.Clair Jan. 1983 30 p refs Presented at the 1st Tech. Conf. on Polyimides, Ellenville, N.Y., 10-12 Nov. 1982
(NASA-TM-84586; NAS 1.15:84586) Avail: NTIS HC A03/MF A01 CSCL 11G

The incorporation of specific metal ions into polyimides is described. Detailed studies have included various compounds of copper, lithium, and palladium as dopants. Addition of the metal during polymerization or after formation of the polyamic acid precedes the thermal imidization step. With many dianhydride-diamine-dopant combinations high quality variously colored films are produced. Many metal doped films exhibit (1) improved high temperature adhesive properties, (2) increased electrical conductivity, (3) excellent thermal stability, (4) improved acid/base resistance, (5) increased modulus in flexible films and (6) excellent high temperature tensile strength. X-ray photo-electron spectroscopic study of these films suggests that many of the additives undergo chemical modification during thermal imidization. Palladium dopants appear to be partially reduced to the metallic state, while lithium and copper dopants are probably converted to their oxides. Ion etching experiments with Auger electron spectroscopy monitoring are discussed. Author

**N83-17711*#** IIT Research Inst., Chicago, Ill.
**SPACE STABLE THERMAL CONTROL COATINGS Final Report, 1 Mar. 1976 - 30 Apr. 1982**
Yoshiro Harada Nov. 1982 94 p refs
(Contract NAS8-31906)
(NASA-CR-170719; NAS 1.26:170719; IITRI-M06020-62) Avail: NTIS HC A05/MF A01 CSCL 11C

A specification quality zinc orthotitanate coating was developed. This silicate-bonded Zn2TiO4 coating is discussed. The effects of precursor chemistry, precursor mixing procedures, stoichiometry variations, and of different heat treatments on the physical and optical properties of Zn2TiO4 are investigated. Inorganic silicates are compared to organic silicone binder systems. The effects of pigment to binder ratio, water content, and of different curing procedures on the optical and physical properties of Zn2TiO4 potassium silicate coatings are also studied. Environmental tests were conducted to determine the UV vacuum stability of coatings for durations up to 5000 equivalent Sun hours. S.L.

**N83-17712*#** Clarkson Coll. of Technology, Potsdam, N.Y. Dept. of Mechanical and Industrial Engineering.
**MATERIAL CHARACTERIZATION OF STRUCTURAL ADHESIVES IN THE LAP SHEAR MODE**
Erol Sancaktar and Steven C. Schenck Jan. 1983 48 p refs
(Grant NAG1-284)
(NASA-CR-169895; NAS 1.26:169895; MIE-89) Avail: NTIS HC A03/MF A01 CSCL 11A

A general method for characterizing structual adhesives in the bonded lap shear mode is proposed. Two approaches in the form of semiempirical and theoretical approaches are used. The semiempirical approach includes Ludwik's and Zhurkov's equations to describe respectively, the failure stresses in the constant strain rate and constant stress loading modes with the inclusion of the temperature effects. The theoretical approach is used to describe adhesive shear stress-strain behavior with the use of viscoelastic or nonlinear elastic constitutive equations. Two different model adhesives are used in the single lap shear mode with titanium adherends. These adhesives (one of which was developed at NASA Langley Research Center) are currently considered by NASA for possible aerospace applications. Use of different model adhesives helps in assessment of the generality of the method. Author

**N83-17713*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
**THE DEVELOPMENT OF AEROSPACE POLYIMIDE ADHESIVES**
Anne K. St.Clair and Terry L. St.Clair Jan. 1983 28 p refs Presented at the 1st Tech. Conf. on Polyimides, Ellenville, N.Y., Nov. 1982
(NASA-TM-84587; NAS 1.15:84587) Avail: NTIS HC A03/MF A01 CSCL 11A

Few materials are available which can be used as aerospace adhesives at temperatures in the range of 300 C. The Materials Division at NASA-Langley Research Center developed several high temperature polyimide adhesives to fulfill the stringent needs of current aerospace programs. These adhesives are the result of a decade of basic research studies on the structure property relationships of both linear and addition aromatic polyimides. The development of both in house and commercially available polyimides is reviewed with regards to their potential for use as aerospace adhesives. Author

**N83-17714*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
**METHOD OF FABRICATING AN ABRADABLE GAS PATH SEAL Patent Application**
D. W. Wisander and R. C. Bill, inventors (to NASA) Filed 30 Sep. 1982 9 p
(NASA-Case-LEW-13269-2; US-Patent-Appl-SN-431448) Avail: NTIS HC A02/MF A01 CSCL 11B

This invention is directed to improving the thermal shock resistance of a ceramic layer. The invention is particularly directed to an improved abradable lining that is deposited on a shroud forming a gas-path seal in turbomachinery. Improved thermal shock resistance of a shroud is effected through the deliberate introduction of 'benign' cracks. These are microcracks which will not propagate appreciably upon exposure to the thermal shock environment in which a turbine seal must function. Laser surface fusion treatment is used to introduce these microcracks. The ceramic surface is laser scanned to form a continuous dense layer. As this layer cools and solidifies, shrinkage results in the formation of a very fine crack network. The presence of this deliberately introduced fine crack network precludes the formation of a catastrophic crack during thermal shock exposure. NASA

**N83-17715*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
**IMPROVED HIGH TEMPERATURE RESISTANT POLYIMIDES Patent Application**
Ruth H. Pater, inventor (to NASA) Filed 13 Oct. 1982 21 p
(NASA-Case-LEW-13864-1; US-Patent-Appl-SN-434087) Avail: NTIS HC A02/MF A01 CSCL 11G

The invention relates to improved polyimide resins which are noted for their high thermal and oxidative stability, high strength at elevated temperatures and which exhibit many other outstanding physical and chemical properties, especially useful in high temperature applications. The polyimides are prepared by the reaction, with application of heat of a mixture of monomers comprising (a) a dialkyl or tetraalkyl ester of an aromatic tetracarboxylic acid; (b) an aromatic diamine; (c) a monoalkyl or dialkyl ester of a dicarboxylic acid; and (d) a N-arylnadimide such as N-phenylnadimide. Polyimides of monomers (a), (b) and (c) are known. The novelty of the invention resides in the discovery that

the inclusion of N-arylnadimide as a reactant provides an improved flow, superior elevated temperature thermo-oxidative stability and better tack and drape characteristics. NASA

**N83-17716#** National Aerospace Lab., Amsterdam (Netherlands). Structures and Materials Div.
**EROSION OF PROTECTIVE COMPRESSOR COATINGS**
H. J. Kolkman Dec. 1981 23 p refs Submitted for publication Sponsored in part by the Royal Netherlands Airforce
(NLR-MP-87067-U) Avail: NTIS HC A02/MF A01

Erosion prone compressor components coatings of gas turbines which are often protected against corrosion by metallic coatings are discussed. These thin coatings however are prone to erosion. Two coatings applied to compressor vanes of a jet engine were tested for erosion under simulated service conditions. Some tests on coated coupons were also performed. The tests on the vanes gave the most reliable results. The erosion resistance of the two coatings was more or less equal. E.A.K.

**N83-17717#** Fernwaermeversorgung Niederrhein G.m.b.H., Dinslaken (West Germany).
**A STUDY ON PLASTIC PIPES Final Report, Dec. 1981**
Alfred Tautz Bonn Bundesministerium fuer Forschung und Technologie Oct. 1982 42 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-82-186; ISSN-0340-7608) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 9

District heating pipelines are usually placed by using medium pipes consisting of steel; it is only in some exceptional cases that plastics are used. In future, plastics could be used for district heating subdistribution in competition with steel pipes provided that pressure and temperature loads will not be too high. The most important advantage of plastics is their anticorrosion property. As far as pipes consisting of glass fiber reinforced EPOXID plastics or of cross linked polyethylene are concerned, a test piping had been installed by which it was possible to prove that these pipes are appropriate under technical aspects and that they are economical, too. The pipelines and their simplified thermal insulations consisting of bulk material in granulate or powder form had been operated with success, during a five years' test period. Author

**N83-17718#** Technische Universitaet, Hanover (West Germany). Inst. fuer Werkstoffkunde.
**INVESTIGATION OF THE THERMAL AGING OF RIGID EXPANDED POLYURETHANE IN DISTANT HEAT PIPES Final Report, Nov. 1981**
Klaus Nolte Bonn Bundesministerium fuer Forschung und Technologie Nov. 1982 231 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie Original contains color illustrations
(BMFT-FB-T-82-197; ISSN-0340-7608) Avail: NTIS HC A11/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 40

Test methods, which describe the thermal aging behavior of rigid expanded polyurethane (PUR) were developed. The mechanical compression test and analytical methods like thermal analysis and infrared spectroscopy, are used to determine thermal aging mechanisms quantitatively. Based on a specific limited value criterion for PUR materials a lifetime temperature correlation has evolved for a test foam. An operation draft is developed to estimate thermal aging behavior of PUR in distant heat pipe in pipe systems. This has been applied successfully to a series of commercial foams and pipe systems. E.A.K.

**N83-17719#** Akron Univ., Ohio. Inst. of Polymer Science.
**EFFECT OF SIZE OF NONREINFORCING FILLERS ON MECHANICAL PROPERTIES OF ELASTOMERS**
P. Dreyfuss and Y. Eckstein Oct. 1982 37 p refs
(Contract N00014-76-C-0408)
(AD-A121614; TR-21) Avail: NTIS HC A03/MF A01 CSCL 11/9

A literature survey of the effect of the particle size of nonreinforcing fillers on the mechanical properties of elastomers and a critical evaluation of the literature results compared to new data from the authors' laboratory were made. The effect of filler content was also considered. The study demonstrated that qualitatively mechanical properties of filled elastomers in general are a complex function of the filler's particle size (surface to volume ratio) and loading (distance between particles). Quantitatively, properties were dependent on the system being studied. Relative modulus, relative breaking elongation, relative breaking stress and swelling ratios were functions of the reciprocal size of the filler up to a particle size of about 140 micrometers. With particles of larger diameter the influence on these properties was smaller. When the distance between particles is smaller than their size, interactions in the volume surrounding the particles may become the dominant variable. GRA

**N83-17720#** Akron Univ., Ohio. Inst. of Polymer Science.
**ROLE OF AMINES IN ADHESION OF POLYBUTADIENE TO GLASS SUBSTRATES. PART 3. EFFECT OF AMINES ON THE REACTION OF PEROXIDE WITH OLEFINIC GROUPS**
Y. Eckstein and P. Dreyfuss Oct. 1982 28 p refs Submitted for publication
(Contract N00014-76-C-0408; NR Proj. 092-555)
(AD-A121613; TR-24) Avail: NTIS HC A03/MF A01 CSCL 09/1

An attempt to elucidate the role of amines in general, and of 3-aminopropyltriethoxysilane in particular, has been made through a study of the title subject by several different approaches. This paper describes a near infrared study of the influence of amines on the reactions of model olefins with dicumyl peroxide. The model olefins were chosen to be representative of typical internal double bonds found in polybutadiene. The study has shown that in addition to serving as radical traps the amines participate in other ways. Exactly what occurs depends on the structure of the amine. GRA

**N83-17721#** Akron Univ., Ohio. Inst. of Polymer Science.
**ROLE OF AMINES IN ADHESION OF POLYBUTADIENE TO GLASS SUBSTRATES. 2: REACTIONS OF AMINES WITH TRIETHYLSILANOL AND/OR FUMED SILICA**
Y. Eckstein and P. Dreyfuss Oct. 1982 34 p refs
(Contract N00014-76-C-0408; NR Proj. 092-555)
(AD-A121612; TR-23) Avail: NTIS HC A03/MF A01 CSCL 09/1

This paper is part of a larger investigation of the role of amines in the adhesion of polybutadience to glass substrates. It describes near infrared, infrared and nuclear magnetic resonance spectroscopy studies of the interaction of amines with silanol groups usually under ambient conditions but sometimes when heated in air. Additional supporting evidence was obtained from gas liquid chromatography, mass spectrometry and elemental analyses. GRA

**N83-17722#** California Univ., Livermore. Lawrence Livermore Lab.
**LIQUID-DROP TECHNIQUE FOR GENERATION OF ORGANIC GLASS AND METAL SHELLS**
C. D. Hendricks 23 Dec. 1981 19 p refs Presented at the 2nd Conv. of the Intern. Colloq. on Drops and Bubbles, Monterey, Calif., 19-21 Nov. 1981
(Contract W-7405-eng-48)
(DE82-005831; UCRL-86116; CONF-811174-4) Avail: NTIS HC A02/MF A01

The technique of capillary wave synchronization of the break-up of single and multiple component jets to produce uniform sized liquid drops and solid particles, and hollow liquid and solid shells is discussed. The technique was used to encapsulate a number of liquids in impermeable spherical shells. Highly uniform glass shells were made by generating uniform drops of glass forming materials in an aqueous solution, subsequently evaporating the water, and then using and blowing the remaining solids in a high temperature vertical tube furnace. DOE

**N83-17723#** Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
**STABILITY OF REFLECTORS WITH POLYMERIC COATINGS**
Paul Schissel and A. W. Czanderna Jan. 1982 20 p refs Presented at the Electrochem. Soc. Corrosion in Solar Energy Systems Conf., Denver, 12-13 Oct. 1981
(Contracts DE-AC02-77CH-00178; EG-77-C-01-4042)
(DE82-007774; SERI/TP-255-1497; CONF-811013-20) Avail: NTIS HC A02/MF A01

One of the possible solutions for improving mirrors for longlife, inexpensive solar concentrators is to coat the reactive mirror material with a polymer. Polymer-coated reflectors may improve optical efficiency and reduce the cost of solar mirrors. Because the mirror/polymer interface may have long-term instabilities in a solar-stressed environment, it is necessary to isolate the effects attributable to the bulk materials from those of the interface. The literature on one of the systems of great current interest, the silver/polymer interface, is reviewed. First, the components of this interface are considered separately. Studies of reactions of environmental gases with silver are summarized. Then, candidate fluoropolymers and polymethylmethacrylate are considered independently of the metal. The thermal, photo, and oxidative degradation reactions are outlined briefly. DOE

**N83-17724#** Westinghouse Electric Corp., Madison, Pa. Advanced Reactors Div.
**SPECIFICATION E-955048 COATING WITH FIBERGLASS REINFORCED RESIN Final Report**
Jan. 1982 7 p
(Contract DE-AC02-80ET-37247)
(DE82-012037; DOE/ET-37247/1-Attach-6) Avail: NTIS HC A02/MF A01

The project scope of work included the complete decontamination and decommissioning (D and D) of the Westinghouse ARD Fuel Laboratories at the Cheswick Site in the shortest possible time. This has been accomplished in the following four phases: (1) preparation of documents and necessary paperwork; packaging and shipping of all special nuclear materials in an acceptable form to a reprocessing agency; (2) decontamination of all facilities, glove boxes and equipment; loading of generated waste into bins, barrels and strong wooden boxes; (3) shipping of all bins, barrels and boxes containing waste to the designated burial site; removal of all utility services from the laboratories; and (4) final survey of remaining facilities and certification for nonrestricted use; preparation of final report. This attachment contains the specifications for fabrication of boxes and for the coating with fiberglass reinforced resin. DOE

**N83-17725#** California Univ., Livermore. Lawrence Livermore Lab.
**HALIDE LASER GLASSES**
Marin J. Weber 14 Jan. 1982 6 p refs Presented at the 1st Intern. Symp. on Halide and Other Non-Oxide Gases, Cambridge, England, 1 Mar. 1982
(Contract W-7405-eng-48)
(DE82-008997; UCRL-87232; CONF-820339-1) Avail: NTIS HC A02/MF A01

Energy storage and energy extraction are of prime importance for efficient laser action and are affected by the line strengths and linewidths of optical transitions, excited-state lifetimes, nonradiative decay processes, spectroscopic inhomogeneities, nonlinear refractive index, and damage threshold. These properties are all host dependent. To illustrate this, the spectroscopic properties of N(3+) was measured in numerous oxide, oxyhalide, and halide glasses. A table summarizes the reported ranges of stimulated emission cross sections, peak wavelengths, linewidths, and radiative lifetimes associated with the F-4 sub 3/2/ yields I-4/sub 11/2/ lasing transition. DOE

**N83-17726#** Shell Oil Co., Houston, Tex.
**COALINGA POLYMER DEMONSTRATION PROJECT Final Report, Jul. 1976 - Dec. 1980**
J. E. Peterson Dec. 1981 270 p refs
(Contracts DE-AC03-77ET-13001; EF-77-C-03-1556)
(DE82-007019; DOE/SAN-1556/5) Avail: NTIS HC A12/MF A01

Water injection began in June 1976 and continued through April 1978. Polymer was injected continuously in the four pilot injectors from May 1978 to October 1979. Water injection was resumed from November 1979 to December 1980. The overall production performance for the pilot was far less than expected. Oil production rate was below the expected primary decline rate when the project was terminated in December 1980. Though the operation of the polymer injection facilities met or exceeded the specifications required, polymer injectivity was substantially lower than predicted (200 BPD actual versus 1000 BPD minimum predicted.) Reservoir parameters at the beginning of the project (July 1976) were reassessed with new petrophysical and performance data. Results of this study indicate that existing oil saturations were only 0.39 versus 0.54 originally predicted. The waterflood residual oil saturation was also increased from 0.235 to 0.28. Thus, the waterflood target was greatly reduced. Final results indicate that polymer flooding is not a viable process in the Zone II Temblor sands in this portion of the East Coalinga Field. DOE

**N83-17727#** Department of Energy, Bartlesville, Okla. Energy Technology Center.
**A CLOSED-LOOP STUDY OF THE EFFECTS OF MULTICYCLE RE-REFINING OF AUTOMOTIVE LUBRICATING OIL**
J. W. Reynolds, J. W. Goetzinger, F. O. Cotton, D. W. Brinkman, and M. L. Whisman Mar. 1982 33 p refs
(DE82-005160; DOE/BETC-RI-81-9) Avail: NTIS HC A03/MF A01

Twenty-five gallons of a hydrofinished virgin lubricating oil basestock was blended with additives into a 10W30 crankcase oil. After the engines were pruged with a flush oil, 11 vehicles were charged with the blended virgin oil. Mileages ranging from 2000 to 3000 miles of use were accumulated before the oil was drained, re-refined and recharged to the vehicles. This cycle was repeated until the oil was re-refined three times. At each stage, detailed analyses and compound characterizations were performed on both the oil being recycled and on the same oil which was re-refined but never charged to vehicles. The data showed no significant change in the composition of the base oil, except for a minor buildup of additive base oil, which was expected. DOE

**N83-17760#** Joint Publications Research Service, Arlington, Va.
**FIAT RESEARCHERS STUDY CERAMICS APPLICATIONS IN DIESELS**
A. Giachello, S. Guerra, and P. C. Martinengo *In its* West Europe Rept.: Sci. and Technol., No. 133 (JPRS-82608) 10 Jan. 1983 p 23-30 refs Transl. into ENGLISH from ATA-Ing. Automotoristica (Italy), Sep. 1982 p 675-679 (For primary document see N83-17757 08-31)
Avail: NTIS HC A03/MF A01

## 28 PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers, storage and handling; and aircraft fuels.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion.*

**N83-17728*#** United Technologies Research Center, East Hartford, Conn.
**EXPERIMENTAL STUDY OF THE THERMAL STABILITY OF HYDROCARBON FUELS**
Pierre J. Marteney, Meredith B. Colket, and Alexander Vranos Dec. 1982 70 p refs
(Contract NAS3-22511)
(NASA-CR-168027; NAS 1.26:168027; R82-955319-20) Avail: NTIS HC A04/MF A01 CSCL 21D

The thermal stability of two hydrocarbon fuels (premium diesel and regular diesel) was determined in a flow reactor under conditions representing operation of an aircraft gas turbine engine. Temperature was varied from 300 to 750 F (422 to 672 K) for fuel flows of 2.84 to 56.8 liters/hr (corresponding to 6.84 x 0.00010 to 1.63 x 0.010 kg/sec for regular diesel fuel and 6.55 x 0.00010 to 1.37 x 0.010 kg/sec for premium diesel fuel); test times varied between 1 and 8 hr. The rate of deposition was obtained through measurement of weight gained by metal discs fixed along the channel wall. The rate of deposit formation is best correlated by an Arrhenius expression. The sample discs in the flow reactor were varied among stainless steel, aluminum and brass; fuels were doped with quinoline, indole, and benzoyl perioxide to yield nitrogen or oxygen concentrations of approximately 1000 ppm. The most substantial change in rate was an increase in deposits for brass discs; other disc materials or the additives caused only small perturbations. Tests were also conducted in a static reactor at temperatures of 300 to 800 F for times of 30 min to 2 1/2 hr. Much smaller deposition was found, indicating the importance of fluid transport in the mechanism. Author

**N83-17729#** Technion - Israel Inst. of Tech., Haifa. Dept. of Aeronautical Engineering.
**THE USE OF SLURRY FUELS IN INDUSTRIAL FURNACES**
Y. M. Timnat, C. Presser, and Y. Goldman Nov. 1980 14 p refs Sponsored by Kernforschungsanlage
(TAE-428) Avail: NTIS HC A02/MF A01

The feasibility of using coal/oil slurries in the experimental, industrial type furnace is discussed. The research to be performed is outlined. Interest in such slurries is growing as a result of the increased demand for coal. Such mixtures will aid in reducing oil consumption and ease the burden on the coal mining industry until it will be able to handle future demand. The mixing of the coal oil slurry and the monitoring of the volumetric flow rate are discussed. R.J.F.

**N83-17730#** Naval Surface Weapons Center, White Oak, Md. Research and Technology Dept.
**ANALYSIS METHODS FOR EXPLOSIVE MATERIALS. 1: POLYNITRO COMPOUNDS Final Report**
Eleonore G. Kayser Mar. 1982 29 p refs
(AD-A119397; NSWC-TR-81-123) Avail: NTIS HC A03/MF A01 CSCL 19/1

A high pressure liquid chromatography method was developed for rapid and quantitative chemical analysis of the following thermally stable explosive materials: DATB, DINA, DIPAM, DNT, DODECA, HNAB, HNBiB, HMX, HNBP, HNS, NONA, ONT, PA, PETN, PYX, RDX, TATB, TETRYL, TNA, TNB, TNN, TNS, TNT, and TPT. Additional chemical characterization of the materials was carried out by nuclear magnetic resonance spectroscopy and by thin layer chromatography. Dimethylsulfoxide was used as the common solvent for all the compounds. GRA

**N83-17731#** Air Force Engineering and Services Center, Tyndall AFB, Fla. Engineering and Services Lab.
**THE SECOND CONFERENCE ON THE ENVIRONMENTAL CHEMISTRY OF HYDRAZINE FUELS Final Report**
William D. Christensen, Ronald F. Hudson, and Sherwin Lewis Apr. 1982 179 p refs Conf. held at Tyndall AFB, Fla., 15 Feb. 1979
(AF Proj. 1900)
(AD-A121324; AFESC/ESL-TR-82-22) Avail: NTIS HC A09/MF A01 CSCL 21/4

On 15 February 1979, the AF Engineering and Services Laboratory, AFESC, Tyndall AFB, Florida, hosted a conference on the environmental chemistry of the hydrazine fuels. Ten papers were presented on various subtopics, which were: (A) Environmental Impact and Assessment of Hydrazine Fuel Usage. (B) Environmental Toxicology. (C) Environmental Monitoring and Disposal of Hydrazines. (D) Environmental Modeling and Chemistry of Hydrazine. The subtitles reflect a wide range of subjects. In Section A the use of H-70 (70 percent hydrazine) in the emergency power unit of the F-16, hydrazine on the space shuttle, and a fuel transportation risk analysis were discussed; in Section B, the toxicity of the hydrazines to selected bacteria and other organisms. This was followed by monitoring of hydrazine fuels vapor by chemiluminescence, and waste disposal by ozonation and chlorinolysis. The conference finished with a presentation on hydrazine spill modeling with estimations of hazard corridors and a summary of environmental physical-chemical properties of the hydrazine fuels. Author (GRA)

**N83-17732#** Ashland Synthetic Fuels, Inc., Ky.
**H-COAL PILOT PLANT. PHASE 2: CONSTRUCTION AND PHASE 3: OPERATION Annual Report**
1 Dec. 1981 25 p
(Contract DE-AC05-76ET-10143)
(DE82-005117; DOE/ET-10143/T10; AR-4) Avail: NTIS HC A02/MF A01

Construction work was completed in March 1981, within budget and without delaying operations. Engineering design solutions were completed for problems encountered with such equipment as the High Pressure Letdown Valves; Slurry Block Valves; Slurry Pumps; and Flakers; and, the Vacuum Tower. The erosion and corrosion program continued. The Quality Assurance program was substantially revised. Significant progress was made in operating the Plant. Environmental and health programs continued to provide worker safety and protection and to obtain data for scientific analysis. Significant progress was made in revising the Waste Water Treatment Plant. DOE

**N83-17733#** Tennessee Valley Authority, Muscle Shoals, Ala. Biomass Fuels Program.
**A SMALL-SCALE ETHANOL PRODUCTION FACILITY DESIGN AND PERFORMANCE**
R. S. Pile, P. C. Badger, and R. G. Nelson 1981 15 p refs Presented at the Winter Meeting of the Am. Soc. of Agr. Engrs., Chicago, 15-18 Dec. 1981
(Contract DE-AI01-80CS-80010)
(DE82-006100; CONF-811221-1) Avail: NTIS HC A02/MF A01

The small scale fuel alcohol facility operated satisfactorily for the evaluations included except for the product flow rate and the boiler performance. However, design product flow rates were sustained using a different stripping column packing. Total energy used in the production process was 214 MJ per L of 190 proof ethanol (53,700 Btu's per gal) of which 53 MJ per L (13,200 Btu's per gal) was electrical energy. In general, the economics of the system appear to be favorable when operated at capacity on an annual basis. Facility construction and operation are relatively simple, and off the shelf or easily available components may be used. With further testing and verification trials, the final design should be well suited for use on farms or by cooperatives interested in small scale fuel alcohol production. There will be further evaluations of other stripping column packings with corn. Also, the facility will be modified to process nongrain feedstocks into ethanol. Technical and economic considerations of these feedstocks will be assessed. DOE

**N83-17734#** Pacific Northwest Lab., Richland, Wash.
**METHANOL SYNTHESIS GAS FROM CATALYTIC STEAM REFORMING OF WOOD**
L. K. Mudge, D. H. Mitchell, R. J. Robertus, S. L. Weber, and L. J. Sealock, Jr. 1981 11 p refs Presented at the 2nd Brazilian Energy Congr., Rio de Janeiro, 6-10 Apr. 1981
(Contract DE-AC06-76RL-01830)
(DE82-006082; PNL-SA-8991; CONF-8104136-1) Avail: NTIS HC A02/MF A01

Catalyst systems and operating conditions for generation of a methanol synthesis gas, a mixture of hydrogen, carbon monoxide and carbon dioxide were developed. Some methane remained in the gas mixture. Wood was reacted with steam at a steam to wood weight ratio of about 0.9 and a temperature of 750 C (1380 F) in the presence of several catalysts. Results are presented for two different catalyst systems. DOE

**N83-17735#** Technical Univ. of Denmark, Lyngby. Lab. for Energiteknik.

**TECHNICAL STANDARDS FOR FUEL CONSUMPTION IN PRIVATE AUTOMOBILES**

Niels Rasmussen and Peter Sunn Pedersen 1981 111 p refs In DANISH

(DE82-900748; DTH-LET-RE-81-1) Avail: NTIS (US Sales Only) HC A06/MF A01; DOE Depository Libraries

Consumer information about fuel consumption of various car makes is discussed. It was decided in Denmark to distribute a yearly official leaflet with standardized measurements of fuel consumption at constant speed of 90 km/h in city driving and mixed driving, information about expenses for yearly 15,000 km driving, weight tax, and other taxes. Regulations of fuel consumption were rejected, but assumptions were investigated through computer simulation. DOE

**N83-17736#** Atlantic Research Corp., Alexandria, Va.

**FURTHER DEVELOPMENT AND EVALUATION OF COAL-WATER MIXTURE TECHNOLOGY**

R. Steven Scheffee, Edward G. Skolnik, Neil P. Rossmeissl, Hartley L. Heaton, and Edward T. McHale 1982 13 p refs Presented at the 4th Intern. Symp. on Coal Slurry Combustion, Orlando, Fla., 10 May 1982

(Contract DE-AC22-80PC-30185)

(DE82-010518; CONF-820519-1) Avail: NTIS HC A02/MF A01

Four different eastern bituminous coals having size consists ranging from 60 to 100% minus 200 mesh were found to be satisfactory for preparation of fluid, stable slurries containing 70% by weight of coal. Control of particle size distribution is required for maximum loadings and good rheological properties where viscosities should not exceed 30 poise for coal water mixtures between 60 and 100% minus 200 mesh. Viscosity is a strong function of dispersant type and content. Best dispersants are anionics in the class of sodium organosulfonates, e.g., Lomar-D and Tamol SN, which are both petrochemicals, and Marasperse CBOs-3, which is a sodium lignosulfonate (a wood derivative). Dispersant content required for fluidity ranges from a few tenths of a part per hundred of coal for a coal size consist of 60% minus 200 mesh to over one pphc for 100% minus 200 mesh. DOE

**N83-17737#** Oak Ridge National Lab., Tenn. Computer Sciences Div.

**ECONOMIC INCENTIVES FOR ADDITIONAL CRITICAL EXPERIMENTATION APPLICABLE TO FUEL DISSOLUTION**

J. F. Mincey, R. T. Primm, III, and W. R. Waltz (Allied-General Nuclear Services) 1981 6 p refs Presented at the Ann. Winter Meeting of the Am. Nucl. Soc., San Francisco, 29 Nov. - 4 Dec. 1981

(Contract W-7405-eng-26)

(DE82-006818; CONF-811103-105) Avail: NTIS HC A02/MF A01

An economic scoping study is presented which demonstrates that additional critical experimentation will likely lead to reductions in the soluble absorber (i.e., gadolinium) purchase costs for dissolution operations. The results indicate that anticipated savings maybe more than enough to pay for the experimental costs. DOE

**N83-17738#** Sandia Labs., Albuquerque, N. Mex.

**SHOCK INITIATION IN HETEROGENEOUS EXPLOSIVES**

J. W. Nunziato, M. E. Kipp, R. E. Setchell, and E. K. Walsh Sep. 1982 58 p refs

(Contract DE-AC04-76DP-00789)

(DE83-002190; SAND-81-2173) Avail: NTIS HC A04/MF A01

The shock initiation of heterogeneous explosives which begins with the formation of hot spots in the vicinity of microstructural defects such as voids, grain boundaries, and phase boundaries where there can be significant localized deformation as a result of material viscosity, plastic work, and intergranular friction is discussed. The phenomenon is described in the context of a theory of chemically reacting, multiphase mixtures. A granular explosive with an energetic binder is considered and is presented as a three phase, saturated mixture consisting of the granular reactant, the binder phase, and the product gases. Under dynamic loading, viscous dissipation results in high temperatures in the binder phase which subsequently thermally explodes to form product gases. Decomposition of the granular reactant is achieved by laminar grain burning. This model is incorporated into a 1-D Lagrangian finite difference code (WONDY) and the evolution of compressive shock and acceleration waves are calculated. DOE

**N83-17739#** Brigham Young Univ., Provo, Utah. Dept. of Chemistry.

**IDENTIFICATION AND MUTAGENICITY OF NITROGEN-CONTAINING POLYCYCLIC AROMATIC COMPOUNDS IN SYNTHETIC FUELS**

Douglas W. Later, Milton L. Lee, Richard A. Pelroy (Pacific Northwest Lab.), and Bary W. Wilson (Pacific Northwest Lab.) 1981 12 p refs Presented at the 6th Symp. on Polycyclic Aromatic Hydrocarbons, Columbus, Ohio, 27 Oct. 1981

(Contract DE-AC06-76RL-01830)

(DE82-006173; PNL-SA-10046; CONF-811086-5) Avail: NTIS HC A02/MF A01

The detailed characterization of synfuel products and byproducts can provide invaluable information relating to the environmental implications of synfuel production and the potential end uses of the products. This paper describes an effective analytical methodology for the separation and identification of nitrogen-containing polycyclic aromatic compound (N-PAC) in these materials, and the results obtained from mutagenicity assays of isolated fractions. Two solvent refined coal liquids were used for this study. Initial separation on neutral alumina was used to obtain an N-PAC fraction. Silicic acid adsorption chromatography was used to get separation of the N-PAC into three additional groups according to the functionality of the nitrogen heteroatom in the aromatic ring system. Then fraction 2 containing amino polycyclic aromatic hydrocarbons, APAH, was derivatized with pentafluoropropionic anhydride for further separation. DOE

**N83-17740#** Brookhaven National Lab., Upton, N. Y. Dept. of Energy and Environment.

**SYSTEMS ANALYSIS OF HYDROGEN SUPPLEMENTATION IN NATURAL GAS PIPELINES**

A. Hermelee, M. Beller, and J. DAcierno Nov. 1981 12 p refs Presented at the 4th Intern. Conf. on Alternative Energy Sources, Miami, Fla., 14-16 Dec. 1981

(Contract DE-AC02-76CH-00016)

(DE82-006933; BNL-30440; CONF-811212-10) Avail: NTIS HC A02/MF A01

The potential for hydrogen supplementation in natural gas pipelines is analyzed for a specific site from both mid-term (1985) and long-term perspectives. The concept of supplementing natural gas with the addition of hydrogen in the existing gas pipeline system serves to provide a transport and storage medium for hydrogen while eliminating the high investment costs associated with constructing separate hydrogen pipelines. This paper examines incentives and barriers to the implementation of this concept. The analysis is performed with the assumption that current developmental programs will achieve a process for cost-effectively separating pure hydrogen from natural gas/hydrogen mixtures to produce a separable and versatile chemical and fuel commodity. A major aspect of the study is to perform a market analysis of traditional uses of resources in the various consuming sectors and the potential for hydrogen substitution in these sectors. DOE

**N83-17741#** California Univ., Livermore. Lawrence Livermore Lab. Liquefied Gaseous Fuels Program.

**FDAS HARDWARE AND FIRMWARE DESCRIPTION, LIQUEFIED GASEOUS FUELS (LGF) DATA-ACQUISITION SYSTEM**

John Baker Mar. 1982 87 p

(Contract W-7405-eng-48)

(DE82-012602; UCID-19348) Avail: NTIS HC A05/MF A01

The FDAS are the front end data acquisition units of the liquefied gaseous fuels data acquisition system (LGFDAS). They acquired data from numerous sensors during liquefied natural gas

(LNG) dispersion and vapor burn experiments. The hardware, functions, commands, messages, and firmware of the FDAS units are described. DOE

**N83-17742#** Los Alamos Scientific Lab., N. Mex.
**METHANE HYDRATE GAS PRODUCTION: AN ASSESSMENT OF CONVENTIONAL PRODUCTION TECHNOLOGY AS APPLIED TO HYDRATE GAS RECOVERY**
Patrick L. McGuire Nov. 1981 20 p refs
(Contract W-7405-eng-36)
(DE82-006746; LA-9102-MS) Avail: NTIS HC A02/MF A01

Two fairly straightforward thermal-stimulation models were developed to bracket the expected gas production from a methane hydrate reservoir. The frontal-sweep model represents the upper bound on hydrate gas production and the fracture-flow model represents the lower bound. Parametric studies were made with these two models to determine the importance of a number of variables, including porosity, bed thickness, injection temperature, and fracture length. A one-dimensional porous flow model was developed to approximate the hydrate gas production by pressure reduction from a hydraulically fractured well. Parametric studies were made with this decompression model to determine the importance of a number of variables, including porosity, initial formation temperature, bottomhole producing pressure, and the permeability in both the hydrated sediment and in the region in which the hydrate was dissociated. A fracture-stimulation technique suitable for this production method was developed. The salt-frac described should make the production of hydrate gas feasible even at temperatures well below 32 F. DOE

**N83-17743#** Pittsburgh and Midway Coal Mining Co., Englewood, Colo.
**SOLVENT-REFINED-COAL (SRC) PROCESS Quarterly Technical Progress Report, Jan. - Mar. 1981**
Nov. 1981 448 p refs
(Contract DE-AC05-76ET-10104)
(DE82-010061; DOE/ET-10104/15) Avail: NTIS HC A19/MF A01

The progress of the Solvent Refined Coal (SRC) project by the Pittsburg & Midway Coal Mining Co. under contract with the Department of Energy is summarized. Included are summaries of three areas of contract work: the SRC Pilot Plant at Fort Lewis, Washington; the Gulf Science and Technology Company Process Development Unit (P-99) in Harmarville, Pennsylvania; and Research and Development technical support services conducted at Harmarville. DOE

**N83-17758#** Joint Publications Research Service, Arlington, Va.
**LPG, HYDROGEN: AUTOMOBILE FUELS OF TOMORROW DISCUSSED**
Philippe Hazan *In its* West Europe Rept.: Sci. and Technol., No. 133 (JPRS-82608) 10 Jan. 1983 p 13-18 Transl. into ENGLISH from Le Matin (France), 11 Oct. 1982 p 18-19 (For primary document see N83-17757 08-31)
Avail: NTIS HC A03/MF A01

# 31 ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; and cryogenics.

**N83-17744*#** California Univ., Livermore. Lawrence Livermore Lab. Optics Lab.
**PRECISION MACHINING TECHNOLOGY AND METROLOGY FOR AXAF STUDY Final Report**
Gregory M. Sanger 15 Jan. 1983 31 p refs
(Contract NAS8-33699)
(NASA-CR-170715; NAS 1.26:170715) Avail: NTIS HC A03/MF A01 CSCL 13H

The optical surfaces for the Advanced X-ray Astrophysical Facility (AXAF), was studied. The applicability of precision machining technology to the manufacture of the AXAF objective mirrors and the proposed and alternative methods for manufacturing and testing; (1) the AXAF technology mirrors and (2) the AXAF high resolution mirror assembly were reviewed. Surface shape and smoothness metrology for grazing incidence X-ray surfaces and the feasibility of applying heterodyne surface profilometry to nonflat surfaces were investigated. Three sets of scattering flats with known surface profiles and microtopographic character produced by precision machining and polished precision machine surfaces were analyzed. S.L.

**N83-17745*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
**MULTICOLOR PRINTING PLATE JOINING Patent Application**
William J. Waters, inventor (to NASA) Filed 28 Sep. 1982 12 p (NASA-Case-LEW-13598-1; US-Patent-Appl-SN-425203) Avail: NTIS HC A02/MF A01 CSCL 13H

An upper plate having ink flow channels and a lower plate having a multicolored 5 pattern are joined without clogging any ink flow paths. A pattern having different colored parts and apertures is formed in a lower plate. Ink flow channels each having respective ink input ports are formed in an upper plate. The ink flow channels are coated with solder mask and the bottom of the upper plate is then coated with solder. The upper and lower plates are pressed together at from 2 to 5 psi and heated to a temperature of from 295 F to 750 F or enough to melt the solder. After the plates have cooled and the pressure is released, the solder mask is removed from the interior passageways by means of a liquid solvent. NASA

**N83-17746*#** National Aeronautics and Space Administration. Pasadena Office, Calif.
**CONTACTLESS PELLET FABRICATION Patent Application**
Mark C. Lee, inventor (to NASA) (JPL, California Inst. of Tech., Pasadena) Filed 26 Oct. 1981 12 p Sponsored by NASA (NASA-Case-NPO-15592-1; US-Patent-Appl-SN-314702) Avail: NTIS HC A02/MF A01 CSCL 13H

A small object is coated by holding it in the pressure well of an acoustic standing wave pattern, and then applying a mist of liquid coating material at low velocity into the pressure well. The pressure gradient within the well forces the mist particles to be pushed against the object. A lower frequency acoustic wave also can be applied to the coated object, to vibrate it so as to evenly distribute the coated material. The same lower frequency vibrations can be applied to an object in the shape of a hollow sphere, to center the inner and outer surfaces of the sphere while it remains suspended. NASA

**N83-17747#** Technische Hochschule, Aachen (West Germany). Inst. fuer Kunststoffverarbeitung.
**DEVELOPMENT OF MOLDING PROCESSES FOR THERMOPLASTS AND THERMOSETS IN CYCLE TIMES INDEPENDENT OF WALL THICKNESS Final Report, Dec. 1979**
Helmuth Reichstein Bonn Bundesministerium fuer Forschung und Technologie Sep. 1982 188 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung
(BMFT-FB-T-82-154; ISSN-0340-7608) Avail: NTIS HC A09/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 35

Investigations of several methods to process thick section plastic moldings in economical cycle times carried out. Several processes and process modifications were developed. As one of the most promising processes, the impact sintering was investigated more closely. ESA

**N83-17748#** Stuttgart Univ. (West Germany). Inst. fuer Statik und Dynamik.
**AN INTERACTIVE SYSTEM FOR TRANSFORMATION OF KNOWN MEASURES LONG INTERNAL SURFACE OF CYLINDERS MODEL FOR SHAFTS [EIN INTERAKTIVES SYSTEM ZUR UMWANDLUNG DER KENNGROESSEN LANGE ZYLINDERSCHALE-BALKENMODELL]**
W. Lang May 1982 96 p refs In GERMAN; ENGLISH summary

(Contract BMFT-03-E-4406-A)
(ISD-294; ISSN-0170-6071) Avail: NTIS HC A05/MF A01

During the layout of rotor blades under structural aspects, uncomplicated and cost effective calculation models should be applied when using the finite element method (FE-method). This is necessary since calculation normally has to be repeated several times to get an optimum solution. The application of beam elements instead of more expensive shell elements takes these facts into account. For FE-Analysis using beam elements several equivalent cross-sectional data - moments of inertia, torsion constant, position of shear center - have to be given. These values are derived from the data of the spar such as cross-sectional geometry, wall thickness and material data. This step of preparing the data in connection with their interactive modification is automatically done by the presented software. S.L.

**N83-17749#** Messerschmitt-Boelkow-Blohm G.m.b.H., Hamburg (West Germany). Transport und Verkehrsflugzeuge.
**SERVICE OPERATION OF A CFRP WINDOW FRAME IN SHORT FIBER PRESSING Final Report, Feb. 1981**
Frank Heinze and Gernard Stemmer Bonn Bundesministerium fuer Forschung und Technologie Sep. 1982 110 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-W-82-021; ISSN-0170-1339) Avail: NTIS HC A06/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 23

Carbon fiber reinforced plastic (CFRP) aircraft window frame research is reported. Author

**N83-17750#** California Univ., Berkeley. Lawrence Berkeley Lab. Energy and Environment Div.
**RESIDENTIAL END USE DEMAND MODELING: IMPROVEMENTS TO THE ORNL MODEL**
James E. McMahon Oct. 1981 11 p refs Presented at the Intern. Conf. on Energy Use Management (ICEUM 3), Berlin, 26-30 Oct. 1981
(Contract W-7405-eng-48)
(DE82-004925; LBL-12660; CONF-811006-9) Avail: NTIS HC A02/MF A01

The ORNL/LBL Residential Energy Demand Model incorporated major improvements in three areas: efficiency of appliances, current construction practice in new houses, and appliance retirements. The new methodology is more general, and provides energy demand estimates in better agreement with recent data. Key areas for future improvements are indicated, including: quantifying the uncertainty in model simulation, redefining the set of end uses, updating the algorithm, and broadening the model's applicability to different geographic areas. A US Department of Energy survey of appliance manufacturers was used to determine new appliance efficiencies. Similarly, surveys of current housing practices (e.g., ceiling insulation level) were used to estimate changes in heating and cooling energy requirements. Appliances are assumed to retire as a function of their age. DOE

**N83-17751#** Oak Ridge National Lab., Tenn. Engineering Technology Div.
**HEAVY-SECTION STEEL TECHNOLOGY PROGRAM Quarterly Progress Report, Jul. - Sep. 1981**
G. D. Whitman and R. H. Bryan Feb. 1982 140 p refs
(Contract W-7405-eng-26)
(DE82-007894; NUREG/CR-2141-Vol-3; ORNL/TM-8145-Vol-3) Avail: NTIS HC A07/MF A01

The Heavy-Section Steel Technology Program is an engineering research activity conducted by the Oak Ridge National Laboratory for the Nuclear Regulatory Commission. The program comprises studies related to all of the technology of materials fabricated into thick-section primary-coolant containment systems of light-water-cooled nuclear power reactors. The investigation focuses on the behavior and structural integrity of steel pressure vessels containing crack-like flaws. Current work is organized into five tasks: (1) program administration and procurement; (2) fracture mechanics analyses and investigations; (3) investigations of irradiated materials; (4) thermal-shock investigations; and (5) pressure vessel investigations. DOE

**N83-17752#** Oak Ridge Y-12 Plant, Tenn. Fabrication Systems Dept.
**UPGRADING A PRODUCTION MACHINE TOOL FOR PRECISION MACHINING**
W. E. Barkman and L. M. Woodard 28 Dec. 1981 24 p
(Contract W-7405-eng-26)
(DE82-006017; Y-2264) Avail: NTIS HC A02/MF A01

Precision machining technology is applied to an existing machine tool. A two axis, T-base lathe was retrofitted with air-bearing slides and spindle, laser interferometer feedback, electric drives, a vibration isolation base, and a computer numerical control system. The resulting contouring capability for a spherical part improved from 4 micron to 1.27 micron while the surface finish capability improved from approximately 0.23 microns to 0.1 microns peak to valley. DOE

**N83-17753#** California Univ., Livermore. Lawrence Livermore Lab.
**QUANTITATIVE ADHESION DATA FOR TWO ENERGETIC PHYSICAL VAPOR-DEPOSITION PROCESSES**
T. G. Beat, G. E. Griggs, and J. W. Dini 15 Dec. 1981 16 p refs Presented at the Am. Electroplaters' Soc. 2nd Symp. on Plating on Difficult to Plate Metals, St. Louis, Mar. 1982
(Contract W-7405-eng-48)
(DE82-004785; UCRL-87010; CONF-820301-3) Avail: NTIS HC A02/MF A01

Quantitative ring shear adhesion data are provided for copper plated on titanium (Ti-6Al-4V) by the hot hollow cathode physical vapor deposition process and copper plated on 304 stainless steel by magnetron ion plating. Adhesion on difficult to plate substrates was quite good and compares favorably with data for electrodeposited coatings on similar substrates. DOE

**N83-17754#** Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.
**DESIGN, CONSTRUCTION, OPERATION AND COSTS OF A MODERN SMALL-SCALE FUEL-ALCOHOL PLANT**
S. A. Leeper, L. J. Dawley, J. H. Wolfram, G. R. Berglund, J. G. Richardson, and R. E. McAtee Jan. 1982 17 p refs Presented at the 6th Ann. Conf. on Energy from Biomass Wastes, Lake Buena Vista, Fla., 25-29 Jan. 1982 Submitted for publication
(Contract DE-AC07-76ID-01570)
(DE82-011019; GG-M-11781; CONF-820127-2) Avail: NTIS HC A02/MF A01

The design used for the small-scale fuel alcohol plant (SSFAP) is discussed. By incorporating a microprocessor into the plant design, most plant operations were automated and labor requirements were reduced. Continuous processing made energy conservation possible, thus reducing energy requirements. A low-temperature, continuous plug-flow cooker design made high yields possible. Ethanol was consistently produced at the SSFAP from corn at a yield of 2.6 gallons (anhydrous) per bushel and an energy requirement of 30,000 to 35,000 Btu/gallon (190-proof). In addition, barley, grain dust, and potato waste were converted at the SSFAP. The capacity of the SSFAP is 180,000 gallons per year (300 days operation). Competitively priced ethanol is produced at this capacity. DOE

**N83-17755#** Lehigh Univ., Bethlehem, Pa. Dept. of Metallurgy and Materials Engineering.
**COMPARISON OF COLD HYDROSTATIC EXTRUSION WITH WIRE DRAWING AS A METHOD OF MANUFACTURING Nb3Sn SUPERCONDUCTING WIRES M.S. Thesis**
Vijay F. Thadani 1981 71 p refs
(Contract DE-AS02-79ER-10367)
(DE82-007533; DOE/ER-10367/7) Avail: NTIS HC A04/MF A01

A series of Nb3Sn monofilamentary wires was prepared by cold hydrostatic extrusion. Another series of conductors was prepared bronze-to-niobium ratios and diffusion treatment as the extruded wires. A direct comparison showed that cold hydrostatic

extrusion can serve as a good alternative to the wire drawing technique of manufacturing Nb3Sn wires because cold hydrostatic extrusion reduces the number of processing steps, i.e., fewer passes and fewer intermediate anneals. The important superconducting properties of the hydrostatically extruded samples were evaluated. The effect of strain on critical current density, J sub c at 4.2K and 8T was examined. DOE

**N83-17756#** AnaChem, Inc., Albuquerque, N. Mex. Environmental Studies Div.
**INDOOR AIR QUALITY HANDBOOK FOR DESIGNERS, BUILDERS AND USERS OF ENERGY EFFICIENT RESIDENCES**
Sep. 1982 174 p refs Prepared in cooperation with Sandia National Labs.
(Contract DE-AC04-76DP-00789)
(DE83-002315; SAND-82-1773) Avail: NTIS HC A08/MF A01

The purpose of the handbook is to assist designers, builders, and users of energy efficient residences to achieve the goals of energy efficiency and maintenance of high indoor air quality simultaneously. Basic concepts of contaminants and their concentrations, sources and removal mechanisms, contaminant distribution, heat transfer, and air exchange are discussed. The effects of the building system on indoor air quality are examined. The effects of the external environment, building envelope, environmental control systems, interior design, furnishings, and inhabitants on the emission, dispersion, and removal of indoor air contaminants as well as direct and indirect effects of energy efficient features are discussed. The health effects of specific air contaminants and the health standards developed for them are examined. Available methods for predicting and measuring contaminants and for evaluating human responses are discussed. Methods and equipment available for the control of indoor air pollution once the contaminants have been identified are also evaluated. The potential legal aspects control indoor air pollution are discussed. DOE

**N83-17757#** Joint Publications Research Service, Arlington, Va.
**WEST EUROPE REPORT: SCIENCE AND TECHNOLOGY, NO. 133**
10 Jan. 1983 33 p refs Transl. into ENGLISH from various West European articles
(JPRS-82608) Avail: NTIS HC A03/MF A01

Combined-cycle power plant tests, low quality fuel, chemical coal-conversion, gasification, research financial management, airbus sales and construction, and LPG and hydrogen automobile fuels are discussed. For individual titles, see N83-17758 through N83-17760.

**N83-17758#** Joint Publications Research Service, Arlington, Va.
**LPG, HYDROGEN: AUTOMOBILE FUELS OF TOMORROW DISCUSSED** **c28**
Philippe Hazan *In its* West Europe Rept.: Sci. and Technol., No. 133 (JPRS-82608) 10 Jan. 1983 p 13-18 Transl. into ENGLISH from Le Matin (France), 11 Oct. 1982 p 18-19 (For primary document see N83-17757 08-31)
Avail: NTIS HC A03/MF A01

In Italy, 450,000 cars are running on liquefied gas. This is now becoming a fashion in France. In the United States, researchers may have succeeded in lowering the cost of hydrogen, which will perhaps be the fuel of the third millenium. Author

**N83-17759#** Joint Publications Research Service, Arlington, Va.
**ATR 42 WILL HAVE ULTRAMODERN, INNOVATIVE COCKPIT, AVIONICS** **c05**
Serge Brosselin *In its* West Europe Rept.: Sci. and Technol., No. 133 (JPRS-82608) 10 Jan. 1983 p 19-22 Transl. into ENGLISH from Aviation Mag. Intern. (France), 1 Nov. 1982 p 38-39 (For primary document see N83-17757 08-31)
Avail: NTIS HC A03/MF A01

The idea of regional aviation has considerably broadened, if only in the area of its capacities. It is not less evident that above and beyond the special operational needs, the 20- to 30-seat categories on one hand and the 40- to 60-seat categories on the other hand correspond to distinct and clearly defined commercial needs. It is the latter category which the ATR-42 is planned for, an ambitious operation envisioning a vast and promising potential market, and, what is more, brought forth by two builders who have considerable resources. Author

**N83-17760#** Joint Publications Research Service, Arlington, Va.
**FIAT RESEARCHERS STUDY CERAMICS APPLICATIONS IN DIESELS** **c27**
A. Giachello, S. Guerra, and P. C. Martinengo *In its* West Europe Rept.: Sci. and Technol., No. 133 (JPRS-82608) 10 Jan. 1983 p 23-30 refs Transl. into ENGLISH from ATA-Ing. Automotoristica (Italy), Sep. 1982 p 675-679 (For primary document see N83-17757 08-31)
Avail: NTIS HC A03/MF A01

It is known that the use of engineered ceramic materials can considerably improve the efficiency of internal-combustion engines by minimizing the heat losses and recovering mechanical energy from the exhaust gases. In particular, such materials' resistance to high temperatures, low coefficient of expansion and very low heat conductivity constitute the basis for development of partially or totally ceramicized engines running in high heat cycles. Author

**N83-17761#** Joint Publications Research Service, Arlington, Va.
**WEST EUROPE REPORT: SCIENCE AND TECHNOLOGY, NO. 134**
20 Jan. 1983 80 p Transl. into ENGLISH from various West European articles
(JPRS-82686) Avail: NTIS HC A05/MF A01

Studies and progress in Western European science and technology are reported. Topics discussed include: biotechnology, genetic engineering; chemicals; electronics; energy; industrial technology, laser machine tools; transportation. For individual titles, see N83-17762 through N83-17765.

**N83-17762#** Joint Publications Research Service, Arlington, Va.
**PHILIPS OPTICAL STORAGE DISCS DESCRIBED** **c35**
*In its* West Europe Rept.: Sci. and Technol., No. 134 (JPRS-82686) 20 Jan. 1983 p 8-13 Transl. into ENGLISH from Die Computer Zeitung (West Germany), 8 Sep. 1982 p 5, 6, 8 (For primary document see N83-17761 08-31)
Avail: NTIS HC A05/MF A01

The optical storage disk is discussed. The capacity of storage media, and information storage and the greater importance management and retrieval is assuming are examined. Additional requirements are levied on new storage media: higher storage capacity than today's magnetic disk systems, distinctly improved price/performance ratio compared to today's mass storage units, capability of filing the new medium and rapid and random direct access. E.A.K.

**N83-17763#** Joint Publications Research Service, Arlington, Va.
**EXPOSITION WILL DISPLAY INNOVATIVE FRG ELECTRONICS** **c33**
Heinz Friedberg and Siegfried W. Best *In its* West Europe Rept.: Sci. and Technol., No. 134 (JPRS-82686) 20 Jan. 1983 p 14-28 Transl. into ENGLISH from Elektron. Ind. (West Germany), 3 Nov. 1982 p 12, 13, 15, 18, 23, 24, 26, 28 (For primary document see N83-17761 08-31)
Avail: NTIS HC A05/MF A01

The electronics exhibit for the manufacturers and users of electronic components is reported. The electronica is a technical information exhibit with discussion between the engineers of the exhibitor and of the user. It is important for the exhibitors to discover the trends of customer requirements. It is an information forum concerning technical innovations for the user. E.A.K.

**N83-17764#** Joint Publications Research Service, Arlington, Va.
**EUROPEAN SEMICONDUCTOR INDUSTRY: MARKETS, GOVERNMENT PROGRAMS** **c33**
Achim Scharf *In its* West Europe Rept.: Sci. and Technol., No. 134 (JPRS-82686) 20 Jan. 1983 p 29-48 Transl. into ENGLISH from Elektron.-Appl., Elektron.-Intern. Suppl. (West Germany), Sep. 1982 p 13-21 (For primary document see N83-17761 08-31)

Avail: NTIS HC A05/MF A01

The marketing of the semiconductor industry in Europe and especially microelectronics which is situated between the millstones of USA and Japan is discussed. The concerned enterprises and governments appear to lack the motivation for close cooperation using European resources, corresponding to the ideas of the contracts on which the common market is based. It is felt that microelectronics is promoted in individual countries under more national perspectives, and the enterprises are pursuing strictly their own interests in cooperating with predominantly American and Japanese partners. An insight into the European semiconductor scene, its markets, as well as assistance for promotion and establishment available in the individual countries is discussed.

E.A.K.

**N83-17765#** Joint Publications Research Service, Arlington, Va.
**FIRST RESULTS, PROBLEMS OF FRENCH DEEP GASIFICATION PROGRAM** **c44**
Pierre Gaussens *In its* West Europe Rept.: Sci. and Technol., No. 134 (JPRS-82686) 20 Jan. 1983 p 49-61 Transl. into ENGLISH from L'Ind. du Petrole Gaz-Chim. (France), Oct. 1982 p 46-52 (For primary document see N83-17761 08-31)
Avail: NTIS HC A05/MF A01

The development of a technology for the gasification of deep coal reserves that are technically and economically not exploitable by classic mining methods was investigated. The principal problem is the very low permeability of the deep coal which makes it necessary to create an artificial connection between the injection and production wells which is done of hydrofracturing method. The possibilities of an electrical connection are studied. Difficulties related to the spontaneous ignition of the coal and the creation of a backward combustion are revealed. Exploration of the factors that might limit the quality of the gas produced or the quantity of coal extracted by doublet is suggested which should lead to obtaining criteria for site selection. Knowledge of the natural conditions of a site is essential for the decision and the selection of the operating method. The characterization can be obtained by using exploration methods such as coring, logging, surface geophysics.

E.A.K.

# 32 COMMUNICATIONS

Includes land and global communications; communications theory; and optical communications.

For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking.*

**N83-17766** Royal Signals and Radar Establishment, Malvern (England).
**A TOOL FOR ANALYZING THE DESIGN AND PERFORMANCE OF A MASCOT ACP NETWORK: INTRODUCTORY REPORT**
A. C. F. Tyler Jun. 1982 27 p refs
(RSRE-3475; BR85268) Copyright. Avail: Issuing Activity

A tool to facilitate analysis of MASCOT systems is described. Both topological and behavior analysis of an ACP network can be performed using techniques of graph theory and event simulation. The simulation environment comprises a number of simulating tasks running under a general purpose operating system that supports pseudo parallelism between the tasks. A data base is created to hold the ACP diagram including node attributes. The topological input is derived from either a set of MASCOT construction commands or from a graphics terminal. Node attributes used in the simulation are created from a set of language statements describing in skeleton from the nature of MASCOT activities, IDAs and devices. Performance data is recorded using a data monitoring program. It is proposed that existing MASCOT machines be instrumented to interface to the simulation program and the data monitor. For use where this is not possible (and to make the tool more general purpose) a method of characterizing MASCOT machines from language statements and interpreting these characterizations is presented.

Author

**N83-17767** National Physical Lab., Teddington (England). Div. of Information Technology and Computing.
**ENHANCEMENT OF THE CCITT TELETEX RECOMMENDATIONS TO INCORPORATE ENCIPHERMENT AND SIGNATURES**
G. I. Parkin Oct. 1982 30 p refs
(NPL-DITC-11/82; ISSN-0262-5369) Copyright. Avail: Issuing Activity

More and more information will be transmitted across data communication networks, some of which is sensitive. This sensitive information needs to be protected by encipherment from passive (e.g., inspection) or active (e.g., substitution) attack. The Teletex service was defined as an international service, which enables subscribers to exchange correspondence on an automatic memory to memory basis via telecommunication networks. The Teletex recommendations were defined without the facilities of encipherment or signatures. The necessary changes to these Teletex recommendations are given to allow the encipherment of correspondence.

S.L.

**N83-17768** Royal Signals and Radar Establishment, Malvern (England).
**INTERNETWORKING IN THE MILITARY ENVIRONMENT**
B. H. Davies and A. S. Bates Jul. 1981 32 p refs
(RSRE-MEMO-3391; BR80727) Copyright. Avail: Issuing Activity

The increasing requirement for data communications in the military environment and the heterogeneous nature of the network technologies and protocols involved are highlighted. The design of a military internet architecture, influenced by the military requirements, especially that of survivability, is discussed. Comparison with the civilian PTT approach to internetworking shows that while there are economic advantages to using civilian international standards where possible, these standards do not satisfy the military requirements. In particular the strategies for routing in a heavily damaged network environment and addressing hosts that migrate from one network to another must form an integral part of the overall architectural design. This results in gateways whose routing tables have a finer degree of detail of the internet topology than is usually required but which do not contain connection oriented information. Finally, practical experience gained on the ARPA catenet system is described.

Author

**N83-17769*#** General Electric Co., Philadelphia, Pa. Space Systems Div.
**CUSTOMER PREMISE SERVICE STUDY FOR 30/20 GHz SATELLITE SYSTEM Final Report**
R. T. Milton, D. P. Ross, A. R. Harcar, P. Freedenberg (M/A COM, Inc.), and D. Schoen (M/A COM, Inc.) Jan. 1983 594 p refs
(Contract NAS3-22890)
(NASA-CR-167986; NAS 1.26:167986; GE-83SDS4206) Avail: NTIS HC A25/MF A01 CSCL 17B

Satellite systems in which the space segment operates in the 30/20 GHz frequency band are defined and compared as to their potential for providing various types of communications services to customer premises and the economic and technical feasibility of doing so. Technical tasks performed include: market postulation, definition of the ground segment, definition of the space segment, definition of the integrated satellite system, service costs for satellite systems, sensitivity analysis, and critical technology. Based on an analysis of market data, a sufficiently large market for services is projected so as to make the system economically viable. A large market, and hence a high capacity satellite system, is found to be necessary to minimize service costs, i.e., economy of scale is found to hold. The wide bandwidth expected to be available in the 30/20 GHz band, along with frequency reuse which further increases the effective system bandwidth, makes possible the high capacity system. Extensive ground networking is required in most systems to both connect users into the system and to interconnect Earth stations to provide spatial diversity. Earth

station spatial diversity is found to be a cost effective means of compensating the large fading encountered in the 30/20 GHz operating band. S.L.

**N83-17770#** Federal Aviation Administration, Atlantic City, N.J.
**MODE S BASELINE RADAR TRACKING Final Report, Jan. - Mar. 1981**
Edward F. Mancus and Leonard H. Baker Nov. 1982 96 p refs (FAA Proj. 034-243-510)
(FAA-RD-82-53; FAA-CT-82-43) Avail: NTIS HC A05/MF A01

The baseline performance characteristics of the moving target detector (MTD) and radar data acquisition system (RDAS) as an integral part of the Mode S sensor, were determined. The MTD and RDAS were separately evaluated to determine their capability to provide radar data suitable for utilization by the Mode S sensor and automated radar terminal system (ARTS). The design modifications made to the Mode S sensor to provide the capability of interfacing to either an MTD or RDAS were evaluated to determine if they were in compliance with the Federal Aviation Administration engineering requirement, FAA-ER-240-26. Radar baseline technical performance data was provided to characterize the MTD, RDAS, Mode S, and ARTS. The minimum radar tracking requirements are studied to determine if they are adequate to provide reliable radar track data to an air traffic control facility. It was concluded that the Mode S sensor, when integrated with an MTD-2 radar digitizer, can provide reliable primary radar track data to the ARTS III system for automated radar track acquisition. S.L.

**N83-17771*#** Illinois Univ., Urbana. Aeronomy Lab.
**NEW ADVANCES IN THE PARTIAL-REFLECTION-DRIFTS EXPERIMENT USING MICROPROCESSORS**
R. L. Ruggerio and S. A. Bowhill 1 Dec. 1982 90 p refs
(Grant NsG-7506)
(NASA-CR-169891; NAS 1.26:19891; AERONOMY-106; ISSN-0568-0581; UILU-eng-82-2506) Avail: NTIS HC A05/MF A01 CSCL 17F

Improvements to the partial reflection drifts experiment are completed. The results of the improvements include real time processing and simultaneous measurements of the D region with coherent scatter. Preliminary results indicate a positive correlation between drift velocities calculated by both methods during a two day interval. The possibility now exists for extended observations between partial reflection and coherent scatter. In addition, preliminary measurements could be performed between partial reflection and meteor radar to complete a comparison of methods used to determine velocities in the D region. S.L.

**N83-17772*#** Illinois Univ., Urbana. Aeronomy Lab.
**FEED SYSTEM DESIGN AND EXPERIMENTAL RESULTS IN THE UHF MODEL STUDY FOR THE PROPOSED URBANA PHASED ARRAY**
J. T. Loane, S. A. Bowhill, and P. E. Mayes 1 Dec. 1982 90 p refs
(Grants NSF ATM-80-02049; NSF ATM-81-20371)
(NASA-CR-169893; NAS 1.26:169893; AERONOMY-107; ISSN-0568-0581; UILU-eng-82-2507) Avail: NTIS HC A05/MF A01 CSCL 17I

The effects of atmospheric turbulence and the basis for the coherent scatter radar techniques are discussed. The reasons are given for upgrading the Radar system to a larger steerable array. Phase array theory pertinent to the system design is reviewed, along with approximations for maximum directive gain and blind angles due to mutual coupling. The methods and construction techniques employed in the UHF model study are explained. The antenna range is described, with a block diagram for the mode of operation used. S.L.

**N83-17773*#** Jet Propulsion Lab., California Inst. of Tech., Pasadena.
**THE 26-METER ANTENNA S-X CONVERSION PROJECT**
15 Mar. 1982 223 p
(NASA-CR-169846; JPL-Pub-82-26; NAS 1.26:169846) Avail: NTIS HC A10/MF A01 CSCL 20N

Programmatic and management aspects of converting an existing 26-meter S-band subnet to a 34-meter S- and X-band subnet of the Deep Space Network are described. The stations involved were DSS 12 near Barstow, DSS 44 in Australia, and DSS 62 in Spain. The main subsystems affected by the conversion were the antenna mechanical, antenna microwave, and receiver-exciter. Antenna mechanial modifications and electronic additions and changes are described. The design and analysis of critical areas are considered and antenna performance is discussed. A.R.H.

**N83-17774*#** COM-CODE, Inc., Mountain View, Calif.
**STUDY OF COMMUNICATIONS DATA COMPRESSION METHODS Interim Final Report**
H. W. Jones Jul. 1978 267 p refs
(Contract NAS2-9703)
(NASA-CR-166225; NAS 1.26:166225) Avail: NTIS HC A12/MF A01 CSCL 17B

A simple monochrome conditional replenishment system was extended to higher compression and to higher motion levels, by incorporating spatially adaptive quantizers and field repeating. Conditional replenishment combines intraframe and interframe compression, and both areas are investigated. The gain of conditional replenishment depends on the fraction of the image changing, since only changed parts of the image need to be transmitted. If the transmission rate is set so that only one fourth of the image can be transmitted in each field, greater change fractions will overload the system. A computer simulation was prepared which incorporated (1) field repeat of changes, (2) a variable change threshold, (3) frame repeat for high change, and (4) two mode, variable rate Hadamard intraframe quantizers. The field repeat gives 2:1 compression in moving areas without noticeable degradation. Variable change threshold allows some flexibility in dealing with varying change rates, but the threshold variation must be limited for acceptable performance. S.L.

**N83-17775#** Dornier-Werke G.m.b.H., Friedrichshafen (West Germany). Hauptabteilung Raumfahrtprogramme.
**PRE-STUDY CONCERNING SYSTEM TECHNIQUES OF COMMUNICATIONS SATELLITES WORKING IN THE 20/30 GHz REGION Final Report, Jul. 1979**
Hans Martin Braun, Horst Braumann, Eberhard Firsch (MBB, Ottobrunn, West Germany), and Klaus Jesche (AEG-Telefunken, Backnang, West Germany) Bonn Bundesministerium fuer Forschung und Technologie Sep. 1982 45 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-W-82-020; ISSN-0170-1339) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 9,50

The need for the use of frequency bands above 15 GHz for communications for the next decades because of an increasing demand of broadband telecommunications and of limited bands below 15 GHz was demonstrated. The frequency range above 15 GHz is characterized by a high atmospheric attenuation, so that terrestrial radio communication links are not able to work economically and satellite communications at 20/30 GHz seem to be the best alternative solution. A possible 20/30 GHz experiment was studied and the German TV-SAT A3 is considered as a baseline platform. E.A.K.

**N83-17776#** Svenska Radio A.B., Stockholm (Sweden). Communications Div.
**SPECTRALLY-EFFICIENT CONSTANT-AMPLITUDE DIGITAL MODULATION SCHEMES FOR COMMUNICATION SATELLITE APPLICATIONS. TASK 1: SURVEY AND SYSTEMATIC CLASSIFICATION OF CPM TECHNIQUES Final Report**
T. Aulin (AUCOM, Skanoer, Sweden), B. Persson, N. Rydbeck, and C-E. Sundberg (SUNCOM, Lund, Sweden) Paris ESA May 1982 536 p refs 2 Vol.
(Contract ESTEC-4765/81/NL-MD)
(U10334-Vol-1; ESA-CR(P)-1657-Vol-1) Avail: NTIS HC A24/MF A01

Continuous or correlative phase modulation (CPM) for use in communication satellite applications is studied. Various approaches for generating constant a amplitude modulation with good detection-efficiency and narrow bandwidth are described. The main parameters controlling the performance are identified. Different receiver structures are considered from a theoretical point of view. S.L.

**N83-17777#** Svenska Radio A.B., Stockholm (Sweden). Communications Div.
**SPECTRALLY-EFFICIENT CONSTANT-AMPLITUDE DIGITAL MODULATION SCHEMES FOR COMMUNICATION SATELLITE APPLICATIONS. TASK 3: TRANSMITTER IMPLEMENTATION**
T. Aulin (AUCOM, Skanoer, Sweden), B. Persson, N. Rydbeck, and C-E. Sundberg (SUNCOM, Lund, Sweden) Paris ESA May 1982 426 p refs 2 Vol.
(Contract ESTEC-4765/81/NL-MD)
(U1033y-Vol-2; ESA-CR(P)-1657-Vol-2) Avail: NTIS HC A19/MF A01

In this task we investigate implementation aspects of different CPM modulators are investigated. Only CPM schemes with fixed modulation index h are considered. In the following we first give the general structures are given the practical implementation aspects are discussed with a few special cases. The basic conceptual transmitter structure is shown. Because of the exact relation needed between the symbol rate and the modulation index this structure is not easily converted into a practical implementation. However, a solution based on this structure is investigated. The three other transmitter structures are studied. The general quadrature transmitter structure, refered to as the ROM structure, is considered. The structure based on a simple PSK modulator followed by a phase locked loop with a certain loop transfer function is also investigated. This structure has certain limitations concerning the g(t)-pulses that can be implemented. It is also limited in the maximum modulation index. S.L.

**N83-17778#** Fernmeldetechnisches Zentralamt, Darmstadt (West Germany). Forschungsinst.
**INTRAQUAD FAR-END CROSSTALK IN LOCAL CABLES**
Klaus Sakowski Jun. 1982 47 p refs In GERMAN; ENGLISH summary
(FI-44-TBr-89) Avail: NTIS HC A03/MF A01

Based on the quasi-transversal crosstalk theory, the process of origin of far end crosstalk in twisted line systems is explained using a theoretical line model. As far as intraquad far end crosstalk is concerned, formulas making possible numerical calculation from the geometric cable dimensions are derived from this model. It is calculated that the intraquad far end crosstalk is entirely real and proportional to the cable length, the coupling period, and the square of the frequency. It is mainly caused by double near end crosstalk via third lines. The factors determining crosstalk, such as line parameters, operating conditions (closed, open, short) as well as coupling functions between the lines are separately examined. Furthermore, methods are presented for determining these important parameters either by calculation or by measurement. The crosstalk portions of all third lines as calculated on the basis of the theory, are analyzed and show the strong influence of the unsymmetrical lines. M.G.

**N83-17779#** Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
**THIRD ALL-UNION SYMPOSIUM ON WAVE DIFFRACTION**
2 Aug. 1982 638 p Transl. into ENGLISH of Mono. "Tretiy Vesesoyuznyy Simpozium po Difraktsii Voln" Moscow, 1964 p 1-244
(AD-A118972; FTD-ID(RS)T-0360-82) Avail: NTIS HC A99/MF A01 CSCL 20/14

Wave diffraction is further space, which draws together the theory of diffraction is related to mathematics and demonstrates the power of mathematical methods for the solution of diffraction problems. The diffraction electromagnetic, acoustic and other waves is considered. GRA

**N83-17780#** Ohio State Univ., Columbus. Electroscience Lab.
**SOPHISTICATED JAMMERS AND ADAPTIVE ARRAYS Quarterly Report**
R. T. Compton, Jr. Jun. 1982 7 p refs
(Contract N00019-18-C-0093)
(AD-A121316; ESL-713603-6; QR-3) Avail: NTIS HC A02/MF A01 CSCL 17/4

This report describes progress under Naval Air Systems Command Contract N00019-81-C-0093 during the third quarterly period. Research on the behavior of adaptive arrays with sophisticated jammers is summarized. Author (GRA)

**N83-17781#** Naval Surface Weapons Center, White Oak, Md. Research and Technology Dept.
**THE EXPERIMENTAL ASPECTS OF COUPLING ELECTRICAL ENERGY INTO A DENSE DETONATION WAVE, PART 1 Technical Report, Apr. 1977 - Sep. 1979**
David L. Demske 17 May 1982 66 p refs
(SR02402003)
(AD-A121262; AD-F500089; NSWC/TR-79-143) Avail: NTIS HC A04/MF A01 CSCL 19/4

An investigation into the effects of coupling 108KJ of electrical energy into the region behind a dense detonation front is considered. The purpose is to overdrive the detonation velocity. This is an interim report discussing the experimental considerations and arrangement for accelerating the 8.8 mm/microsecs detonation velocity of PBX9404, by injecting a 0.17 Megamp current pulse into the conductive zone of a detonating explosive. The stored, electrical energy from a variable, fast-switched storage inductor is selectively transferred into the partially-conductive region behind the detonation front, culminating in the increase of the reaction energy in the detonation process. The effects are principally of an ohmic-heating nature. Streak camera diagnostics are employed to assess the extent to which electrical coupling can be effected in comparison to the theoretically established, 20% increase in detonation velocity. The details of experimental parameters influencing such interactions and the diagnostic techniques currently employed are discussed. GRA

**N83-17782#** Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
**DEVELOPMENT OF A VOICE FUNNEL SYSTEM Quarterly Technical Report, 1 May - 31 Jul. 1982**
J. Goodhue, Jr. Oct. 1982 34 p
(Contract MDA903-78-C-0356; ARPA Order 3653)
(AD-A121272; BBN-5203; QTR-16) Avail: NTIS HC A03/MF A01 CSCL 17/2

This Quarterly Technical Report covers work performed during the period noted on the development of a high-speed interface, called a Voice Funnel, between digitized speech streams and a packet-switching communications network. Author (GRA)

**N83-17783#** Massachusetts Inst. of Tech., Cambridge. Lab. for Computer Science.
**A TELEX GATEWAY FOR THE INTERNET**
Friedrich Meier zu Sieker May 1982 96 p refs
(Contract N00014-75-C-0661)
(AD-A121597; MIT/LCS/TM-222) Avail: NTIS HC A05/MF A01 CSCL 17/2

The design of a gateway connecting one of the networks of the MIT Laboratory for Computer Science to the telex network is discussed. A description of the telex network is given. The relationship of the gateway to other resources of the network environment is considered to obtain directions for the implementation of new resources. The implementation of the gateway on the UNIX operating system outlined. Author (GRA)

**N83-17784#** Sandia Labs., Albuquerque, N. Mex. Systems Engineering Div.
**VOICE SYNTHESIS APPLICATION**
Philip C. Lightstone and William M. Davidson 27 Jan. 1982 11 p refs Presented at the Mini-microcomputer Inform. Interchange Meeting, Rocky Flats, Colo., 17 Feb. 1982
(Contract DE-AC04-76DP-00789)

(DE82-010358; SAND-82-0415C; CONF-820212-1) Avail: NTIS HC A02/MF A01

Selection of a speech synthesis system as an augmentation for a perimeter security device is described. Criteria used in selection of a system are discussed. The final system is a speech 1000 speech synthesizer board that has a 2000 word speech lexicon, a first time charge for a 32 K EPROM of custom words, and extra features such as an alternate command to adjust desired listening level. DOE

**N83-17785#** Los Alamos Scientific Lab., N. Mex.
**DYNAMIC PARAMETER ARRAY SYSTEM (DPA)**
Gail T. Anderson, Michael A. Oothoudt, James F. Amann, and Thomas Kozlowski 1981 7 p Presented at the Digital Equipment Computer Users Soc., Los Angeles, 7-11 Dec. 1981 Submitted for publication
(Contract W-7405-eng-36)
(DE82-004327; LA-UR-81-3400; CONF-811214-3) Avail: NTIS HC A02/MF A01

This paper describes software which provides a means to change dynamically (in real time) the values of parameters in an executing task. The parameters reside in an RSX-11M memory management region or a VMS shared global section. Values may be accessed and altered by any task attaching the region, including an interactive task. The interactive task may be run from the keyboard to allow user interaction with parameters stored in the region. Keyboard commands allow the user to make a disk file copy of values in the region, modify values in the region, and define meaningful synonyms to use in referring to parameters in the region. DOE

**N83-17786#** Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Information und Dokumentation.
**MAINTENANCE FRIENDLINESS OF RADAR SYSTEMS: CRITERIA FOR DEVELOPMENT AND ACCEPTANCE [WARTUNGSFREUNDLICHKEIT BEI RADARGERAETEN: KRITERIEN FUER ENTWICKLUNG UND ABNAHME]**
G. Stark 1982 38 p refs In GERMAN Presented at CCG-Lehrgang Spezielle Probleme und Verfahren der Radartech., 1981 (MBB-UA-654-O) Avail: Issuing Activity

The criteria and realization steps of the development phases of a radar system which are required to obtain maintenance friendliness, are explained. In a generally complicated decision process the requirements of the maintenance study are weighed against other requirements and a raster of construction elements is determined. Using the maintenance study results, it can be decided in which form the test information can be used for test signals and simulations. With the help of the transponder the characteristics of the test signals are accurately known in most cases. Author (ESA)

**N83-17787#** Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
**PROPAGATION EFFECTS OF ECM RESISTANT SYSTEMS IN COMMUNICATION AND NAVIGATION**
Aug. 1982 169 p refs Proc. of 30th Symp. held in Copenhagen, 24-28 May 1982 2 Vol.
(AGARD-CP-331; ISBN-92-835-1432-7) Avail: NTIS HC A08/MF A01

Propagation characteristics of the medium become more and more essential for the design of modern systems in communication, navigation and related fields. Steady advancement in adapting signal characteristics and modulation methods to modern transmission systems requires increasing attention to limitations governed by parameters other than technological ones. They mainly refer to effects caused by propagation media. Thus operational reliability may ultimately be controlled by the characteristics of this media or, in other words, by the anthropogenic capability of adapting systems to variations in medium behavior. A particularly important field of system-oriented applications concerns communication and navigation systems resistant to Electronic Counter Measures. Propagation limitations may be identified in terms of several categories in surface vicinity, general long-distance links, and medium-area coverage. The Symposium dealt with the present state-of-the-art; future possibilities were also discussed. For individual titles, see N83-17788 through N83-17800.

**N83-17788#** General Electric Co., Syracuse, N.Y.
**HF RADAR IONOSPHERIC CLUTTER**
George H. Millman *In* AGARD Propagation Effects of ECM Resistant Systems in Commun. and Navigation Aug. 1982 13 p refs (For primary document see N83-17787 08-32)
Avail: NTIS HC A08/MF A01

The characteristics of HF radar echoes reflected from ionization irregularities aligned along the lines of force of the Earth's magnetic field are presented. Utilizing experimental radar-ionospheric clutter data acquired at frequencies between HF and UHF, an analysis is made of the amplitude, the cross-sectional area and the angular extent statistics of HF field-aligned echoes. The Doppler frequency variation, the frequency of occurrence and the diurnal and seasonal variation of HF ionospheric backscatter echoes and their correlation with solar-geophysical conditions are also discussed. Author

**N83-17789#** Exeter Univ. (England). Dept. of Physics.
**FAST FADING CHARACTERISTICS OF MEDIUM RANGE H.F. SIGNALS**
V. B. Mitchell *In* AGARD Propagation Effects of ECM Resistant Systems in Commun. and Navigation Aug. 1982 3 p ref (For primary document see N83-17787 08-32)
Avail: NTIS HC A08/MF A01

Medium range (approximately 6000 km) h.f. signals are examined in some detail to establish their fast fading characteristics. The data base consists of some 5,800 samples recorded in 1975 and 1976. The sample bandwidth is from 8Hz to 240Hz. Thus the results of this work are particularly applicable to estimating the performance of medium rate digital circuits which include similar h.f. radio links. In evaluating the characteristics particular attention was paid to obtaining a clear comparison between single propagation mode signals, where the fading is almost entirely due to the ionosphere, and multimode signals, where a proportion of the fading is due to inter-modal interference at the receiver. A mean ratio is obtained between two of the principal parameters of single and multimode signals and a method is suggested for application in channel simulation systems which is based on the experimental results. Author

**N83-17790#** German Military Geophysical Office, Traben-Trarbach (West Germany).
**VHF-, UHF- AND SHF-PROPAGATION LIMITATIONS IN THE MARINE ATMOSPHERE**
K.-E. Fischer *In* AGARD Propagation Effects of ECM Resistant Systems in Commun. and Navigation Aug. 1982 22 p refs (For primary document see N83-17787 08-32)
Avail: NTIS HC A08/MF A01

In the marine atmosphere, evaporation ducts, elevated layers, and sea surface reflections are the main features of EM-wave propagation in the VHF-, UHF-, and SHF-bands over the sea. These propagation modes are discussed, especially their limiting effects on telecommunication and navigation systems, e.g. multipathing, pulse distortions, intercept susceptibility, and radar disintegration. Possibilities of analyzing/forecasting the limitation mentioned above are described. For example, applications of meteorological boundary layer theory and relations to simple ray theory and mode theory are suitable, such like actual meteorological measurements on board a ship and predictions and considerations on vertical and horizontally homogeneity of meteorological fields. It will be elucidated that, in many cases, no technical remedies exist to overcome limitations due to the marine atmosphere.
Author

**N83-17791#** National Telecommunications and Information Administration, Boulder, Colo. Inst. for Telecommunication Sciences.
**THE ATMOSPHERIC PROPAGATION MEDIUM BETWEEN 45 AND 75 GHz**
Hans J. Liebe *In* AGARD Propagation Effects of ECM Resistant

Systems in Commun. and Navigation Aug. 1982 12 p refs (For primary document see N83-17787 08-32)
(Contract ARO-6-82)
Avail: NTIS HC A08/MF A01

The clear atmosphere (dry air mass) represents a unique filter over the 45 to 76 GHz range with frequency-dependent absorption properties caused by the microwave spectrum of oxygen not found at any lower frequency. The basic information necessary for determining molecular line, band, and continuum absorption is contained in a transfer function model. Close to sea level, an unstructured band exists, centered at 60 GHz with a half-width of 8 GHz and a pressure-dependent intensity that is corrected for pressure induced line overlap effects. At elevations above 12 km, the lines separate and radio channels with up to 400 MHz bandwidth can be accommodated between lines. Above 30 km, the line properties become polarization and orientation (i.e., with respect to the direction of a magnetic field) dependent due to the Zeeman effect. Each oxygen line splits proportionally with geomagnetic field strength (0.2-0.8 Gauss) into numerous sub-lines, which conform to Zeeman patterns extending over a megahertz scale around each line center. Using this model in computer routines in conjunction with distributions of pressure, temperature, and humidity along a radio path makes it possible to predict frequency-dependent signal attenuation and delay effects of the neutral atmosphere (h=0 to 100 km). Further analysis investigates possible bandwidth limitations of the propagation medium by employing short-pulsed (less than 1 ns) test signals with carriers in the 45 to 75 GHz range. Examples are presented of specific attenuation (dB/km) and excess delay (ps/km) rates, of zenith path attenuation (dB), and of pulse distortion over a terrestrial link (50 GHz, 35 km) for Gaussian, rectangular, and BPSK modulation. Benefits from the frequency-variable atmospheric properties include a fairly well defined signal range, affording transmission security and trade-offs between range and susceptibility to detection and interference. Author

**N83-17792#** Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany). Unternehmensbereich Apparate.
**MILLIMETER-WAVE PROPAGATION IN SURFACE VICINITY**
Wolf-D. Schuck and Juergen Detlefsen (Munich Technical Univ.) *In* AGARD Propagation Effects of ECM Resistant Systems in Commun. and Navigation Aug. 1982 6 p refs Original language document announced as N83-13345 (For primary document see N83-17787 08-32)
Avail: NTIS HC A08/MF A01

For short distance links without broadcasting requirements the use of mm-waves in connection with highly directive antennas is one approach to ECM-resistance. In case of short range surface-surface-missiles, e.g. high speed anti-tank guided weapons, where mechanical links like wire or optical fiber cannot be used, the application of mm-waves may be advantageous compared to the restricted performance of LASER links in a battlefield environment. Multipath fading especially over smooth ground covers like asphalt, requires diversity techniques and/or a transmitter power, which has to be essentially raised compared to a multipath-free LOS (line of sight) link. Thereby the vulnerability of the weapon system by ECM or hard weapon action is strongly affected, since the performance of tankborne ESM-equipment is a direct function of the transmitter power. The objective of the works presented in this paper is to determine propagation effects under various near-surface conditions. The measurement results are compared to theoretical models. Measurements are accomplished in the 35 GHz frequency band. Results are given for surfaces like asphalt, water, gravel and grass. Author

**N83-17793#** National Telecommunications and Information Administration, Boulder, Colo. Inst. for Telecommunication Sciences.
**RELATIVE COST-BENEFITS ASSOCIATED WITH ALTERNATIVE TERRAIN REPRESENTATIONS IN ELECTRONIC WARFARE SIMULATION**
John P. Murray *In* AGARD Propagation Effects of ECM Resistant Systems in Commun. and Navigation Aug. 1982 13 p refs (For primary document see N83-17787 08-32)
Avail: NTIS HC A08/MF A01

Terrain is widely recognized as a critical influence on VHF and UHF radio signal strengths, and hence on radio communications range. The same terrain influences have major effects on other aspects of tactical operations, particularly mobility of the tactical units. Both classes of influence are considered in various ways in simulating tactical operations. Planners are faced with a conflict between the need to represent physical circumstances as accurately as possible and constraints on the resources available to the planning process. Resources of principal concern are the funds available to develop adequate representations of terrain and their mathematical analogs, and the computational power and time required to apply them during the course of planning simulations. In many cases, the need to evaluate many signal paths in each of many scenarios produces a computation-intensive process that forces approximations that are substantially cruder than the current state of the propagation prediction art could use to advantage. This paper describes several approaches to terrain treatment, summarizes their relative costs and benefits, and compares the benefits achieved in each case with the fidelity produced by comparable terrain considerations in mobility estimates. The effect on the interpretation of simulation results for both discrete and general studies is also discussed. Author

**N83-17794#** Mitre Corp., Griffiss AFB, N.Y.
**PREDICTIONS OF MULTIPATH LEVELS FOR AIR-TO-AIR ECM-RESISTANT COMMUNICATION SYSTEMS**
David P. Koester *In* AGARD Propagation Effects of ECM Resistant Systems in Commun. and Navigation Aug. 1982 16 p refs (For primary document see N83-17787 08-32)
Avail: NTIS HC A08/MF A01

The results of an investigation of the relative levels of reflected energy due to ground multipath propagation in Direct Sequence (DS) or Pseudorandom Noise (PN) modulated spread-spectrum systems are presented. Both specularly and diffusely reflected signals were examined with parametric assessments made as a function of airborne transmitter/receiver separation range, transmitter/receiver altitudes and various terrain characteristics for a PN-modulated spread-spectrum system operating in the UHF band (225-400 MHz) with a 4 megabit-per-second chipping rate. Areas where multipath effects in wideband digital systems are dissimilar to those in narrowband systems are identified and examined. Computer modeling was used to calculate the ratio of reflected signal power to direct path signal power as a function of range for specularly reflected signals and as a function of the number of delayed chips and range for diffusely reflected signals. Author

**N83-17795#** Boston Univ., Mass. Dept. of Astronomy.
**HF PROPAGATION FACTORS AFFECTING THE DESIGN AND OPERATION OF REAL TIME, CHANNEL EVALUATION, ADAPTIVE SYSTEMS**
Jules Aarons and Mario D. Grossi (Harvard-Smithsonian Center for Astrophysics) *In* AGARD Propagation Effects of ECM Resistant Systems in Commun. and Navigation Aug. 1982 16 p refs (For primary document see N83-17787 08-32)
Avail: NTIS HC A08/MF A01

To develop and operate an adaptive system, propagation factors of the ionospheric medium must be given to the designer. The operation of the system must change as a function of multipath spread, Doppler spread, path losses, channel correlation functions, etc. In addition, NATO mid-latitude HF transmission and transauroral paths require varying system operation, which must fully utilize automatic path diversity across transauroral paths. Current research and literature are reviewed to estimate the extent of the available technical information. Additional investigations to allow designers to orient new systems on realistic models of these parameters are suggested. Author

**N83-17796#** Communications Research Centre, Ottawa (Ontario).
**IMPLICATIONS OF THE TIME-VARIANT PROPERTIES OF THE HF SKYWAVE CHANNEL FOR THE DESIGN AND PERFORMANCE OF SMALL ADAPTIVE ANTENNA SYSTEMS**

Robert W. Jenkins *In* AGARD Propagation Effects of ECM Resistant Systems in Commun. and Navigation Aug. 1982 14 p refs Sponsored in part by the Canadian Dept. of National Defence (For primary document see N83-17787 08-32)
Avail: NTIS HC A08/MF A01

The effect of propagation-related time variations on the performance of a 4-element adaptive array was studied by computer-modelling techniques. The signals were modelled to have time variation representative of those expected in HF naval communications, including Doppler shifts, antenna-independent fading, antenna-dependent polarization fading, position-dependent multipath fading and direction changes. Various techniques were modelled. The adaptation algorithms including the LMS algorithm, the LMS algorithm modified to include time-averaged estimates in the weight corrections, and the sample matrix inversion algorithm. The latter two techniques employed time-averaging. The modelled communications included either an additive coded pilot signal or a spread spectrum pilot code, to distinguish it from interference. The corresponding reference signal was either internally generated in the adaptive array, or derived from the output by appropriate filtering. The modelled time variations caused performance deterioration that depended on the adaptation of the array and the amount of time-averaging used. The faster-adapting algorithms performed best. Doppler-shift-associated performance deterioration for slow adapting algorithms was removed by including an output-derived reference. The performance deterioration was greater for longer averaging times. Averaging times between 20 and 50 ms were found to represent a good compromise between the conflicting requirements imposed by the improved statistical accuracy of longer times and the faster response to changes of shorter times. Author

**N83-17797#** AEG-Telefunken, Ulm (West Germany). Research Inst.
**ADAPTIVE EQUALIZATION OF TROPOSCATTER CHANNELS WITH FSK MODULATION: PART 1. THEORY AND COMPUTER SIMULATION**
Eberhard Bitzer *In* AGARD Propagation Effects of ECM Resistant Systems in Commun. and Navigation Aug. 1982 9 p refs (For primary document see N83-17787 08-32)
Avail: NTIS HC A08/MF A01

The basic concept of an adaptive equalizer particularly suited for troposcatter channels with FSK modulation is presented. The three main features of the equalizer are: (1) a new error criterion which needs no explicit carrier synchronization; (2) a new nonlinear feedback branch for improving the equalizer performance and (3) a transversal filter structure, which uses only real coefficients for bandpass signals. The theoretical background of these features is sketched. The performance characteristics of the new equalizer are demonstrated and compared with the performance of conventional equalizers by discussing some simulation results for a data rate of 8.448 Mbit/s. Author

**N83-17798#** AEG-Telefunken, Backnang (West Germany).
**ADAPTIVE EQUALIZATION OF TROPOSCATTER CHANNELS WITH FSK MODULATION: PART 2. HARDWARE STUDY AND MEASUREMENTS**
Ulrich Buse *In* AGARD Propagation Effects of ECM Resistant Systems in Commun. and Navigation Aug. 1982 13 p (For primary document see N83-17787 08-32)
Avail: NTIS HC A08/MF A01

The experimentally derived performance of a preliminary hardware model of an adaptive equalizer is described. The structure of this equalizer was determined by theoretical investigations and simulation studies which were presented in the previous paper with the referenco number 11. The novelty of the equalizer structure is the kind of error-signal derivation, which utilizes the constant IF envelope of the FSK modulation. Distortions in the troposcatter channel were generated by a channel simulator. Carried out were steady-state measurements with fixed tap-coefficients and dynamic measurements with sinusoidal tap-coefficients in the channel simulator. The efficiency of equalization can be determined by comparing the eye-patterns and the bit-error rate as a function of the carrier-to-noise ratio with the equalizer in and out of the circuit. It is possible to adjust for such severe distortions that, even with a high carrier-to-noise ratio, the bit stream cannot be detected. With the equalizer, this is again possible. The transient response of the equalizer was measured by changing the tap-coefficients in accordance with a step-function. The measured response time of the equalizer was about 15 microseconds. This makes the equalizer fast enough for troposcatter applications. Used as bit stream was a binary pseudo-random sequence without an additionally injected identification word at a bit rate of 8.448 Mbit/s. Author

**N83-17799#** National Telecommunications and Information Administration, Boulder, Colo. Inst. for Telecommunication Sciences.
**OPERATIONAL IMPLICATIONS OF PROPAGATION MODELS USED IN COMMUNICATIONS EVALUATION IN TACTICAL ELECTRONIC WARFARE PLANNING**
John P. Murray *In* AGARD Propagation Effects of ECM Resistant Systems in Commun. and Navigation Aug. 1982 9 p refs (For primary document see N83-17787 08-32)
Avail: NTIS HC A08/MF A01

Propagation models are used to estimate both desired and unwelcome signals in communications systems used in tactical military operations. The variability associated with propagation influences, particularly in the highly mobile and uncertain locales of representative scenarios, introduces unusual factors in the evaluation of simulation results. Practical constraints on resources that can be devoted to communications and jamming effects during simulation require various approximations. The several applications for which propagation models are used are identified and several descriptive classifications within which models may be evaluated are discussed. A series of performance measures popularly used in communications and electronic warfare planning are reviewed and are used as the basis for describing the implications which arise from the use of each class of models. Implications with regard to communications and jamming range, reliability, and detection range are discussed. Author

**N83-17800#** National Telecommunications and Information Administration, Boulder, Colo. Inst. for Telecommunication Sciences.
**AN ATLAS OF PROPAGATION CURVES FOR TACTICAL ELECTRONIC WARFARE PLANNING IN GROUND-TO-GROUND SCENARIOS**
John P. Murray *In* AGARD Propagation Effects of ECM Resistant Systems in Commun. and Navigation Aug. 1982 14 p refs (For primary document see N83-17787 08-32)
Avail: NTIS HC A08/MF A01

A series of 24 sets of propagation curves suitable for the prediction of communications and jamming system performance are presented. Curves are presented for frequencies of 50 and 300 MHz and transmitter heights from 1 to 200 meters. All curves are for path distances from 2 to 100 kilometers. Results are presented for reliability values of 10%, 50% and 90%. Calculations were made using the Irregular Terrain Model under continuing development at the Institute for Telecommunication Sciences. Author

**N83-18394#** Marconi Space and Defence System Ltd., Stanmore (England). Guided Weapon Div.
**RADAR SEEKERS FOR PRECISION GUIDED MUNITIONS**
Douglas A. Ramsay *In* AGARD Precision Guided Spacecraft. Technol. and Operational Aspects Sep. 1982 15 p Sponsored in part by the UK Ministry of Defence (For primary document see N83-18390 08-66)
Avail: NTIS HC A06/MF A01

# 33 ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics.*

**N83-17801#** Federal Aviation Administration, Atlantic City, N.J.
**PLAN VIEW DISPLAY MODIFICATIONS FOR THE 9020 REPLACEMENT SYSTEM Final Report, May - Oct. 1981**
John J. Carr Oct. 1982 55 p
(FAA Proj. 231-132-210)
(FAA-CT-82-25) Avail: NTIS HC A04/MF A01

The modifications that were made to a plan view display (PVD) which allowed it to be switched between the present National Airspace System and a future 9020 Replacement (9020R) System are described. A second PVD was also modified and used to simulate the outputs of the 9020R System. The outputs of the simulated 9020R System were analog X and Y deflection signals, video unblanking, and brightness control bits. The PVD switch was controlled by a spare switch located on the front panel. The PVD was driven either in the normal manner by the present system or by the remote signals brought in from the 9020R simulator PVD. The R-controls were also switched between two different radar keyboard multiplexer output connectors by means of an external relay box controlled by the front panel switch of the PVD. The switched PVD was driven over cable lengths of 20, 50, 70, and 100 feet. Line width and brightness measurements were taken and display patterns were observed at each of these lengths. Results were very good up to 70 feet and satisfactory up to 100 feet. Author

**N83-17802*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
**DIELECTRIC BASED SUBMILLIMETER BACKWARD WAVE OSCILLATOR CIRCUIT Patent Application**
Henry G. Kosmahl, inventor (to NASA) Filed 13 Oct. 1982 9 p
(NASA-Case-LEW-13736-1; US-Patent-Appl-SN-434084) Avail: NTIS HC A02/MF A01 CSCL 09C

A ladder circuit especially useful in backward wave oscillators operating in the 500 GHz to 2000 GHz range has a waveguide with transversely orientated slabs which contact an upper wall of the waveguide. The edges of the slabs adjacent to the physical center of waveguide curved segments and stubs of electrically conductive, nonmagnetic material. The ends of slabs include metal layers at opposite ends to provide a conductive leakage path. A ridge bar is attached to the inside of the bottom wall of the waveguide and includes a concave upper surface which partially straddles the electron beam. The novelty of the invention lies in the ladder structure compared of thin, vapor deposited rungs supported on the edge of diamond slabs; each rung having a curved segment which straddles the electron beam together with a ridge bar which also straddles the electron beam. NASA

**N83-17803*#** National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
**THREE PHASE POWER FACTOR CONTROLLER WITH INDUCED EMF SENSING Patent Application**
Frank J. Nola, inventor (to NASA) Filed 16 Dec. 1982 26 p
(NASA-Case-MFS-25852-1; US-Patent-Appl-SN-450319) Avail: NTIS HC A03/MF A01 CSCL 09C

A means is provided for sensing the induced emf produced by an ac induction motor during the time interval in each half cycle when the thyristor is in the 'off state' and for producing a feedback signal for use in controlling switching of the thyristor. For a three phase motor, the sensing means includes: (1) a square wave voltage shaping circuit, connected between the line voltage terminal and an electronic switching circuit, (2) a high gain operational amplifier connected to the motor to neutral voltage terminal through the electronic switching circuit for amplifying and selectively inverting a voltage proportional to the motor to neutral voltage; and (3) a diode for blocking the output of the operational amplifier when this output is of a first polarity. NASA

**N83-17804*#** National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
**PHASE DETECTOR FOR THREE-PHASE POWER FACTOR CONTROLLER Patent Application**
Frank J. Nola, inventor (to NASA) Filed 16 Dec. 1982 24 p
(NASA-Case-MFS-25854-1; US-Patent-Appl-SN-450166) Avail: NTIS HC A02/MF A01 CSCL 09C

A phase detector for the three phase power factor controller (PFC) is described. The phase detector for each phase includes an operational amplifier which senses the current phase angle for that phase by sensing the voltage across the phase thyristor. Common mode rejection is achieved by providing positive feedback between the input and output of the voltage sensing operational amplifier. This feedback preferably comprises a resistor connected between the output and input of the operational amplifier. The novelty of the invention resides in providing positive feedback such that switching of the operational amplifier is synchronized with switching of the voltage across the thyristor. The invention provides a solution to problems associated with high common mode voltage and enables use of lower cost components than would be required by other approaches. NASA

**N83-17805*#** National Aeronautics and Space Administration. Pasadena Office, Calif.
**ELECTRONIC SYSTEM FOR HIGH POWER LOAD CONTROL Patent Application**
Emmett L. Miller, inventor (to NASA) (JPL, California Inst. of Tech., Pasadena) Filed 24 Dec. 1980 15 p Sponsored by NASA
(NASA-Case-NPO-15358-1; US-Patent-Appl-SN-219968) Avail: NTIS HC A02/MF A01 CSCL 09C

An electronic control system for a high power load is provided with a plurality of parallel current paths are divided into two groups with control devices in the current paths of one group each having a current limiting resistor, and control devices in the current paths of the other group each having no current limiting resistor, so that when the control devices of the second group are turned fully on, a short circuit is achieved by the arrangement of parallel current paths. Separate but coordinated control signals are provided by suitable means to first turn on the control devices of the first group and increase their conduction toward saturation as a function of control input, and when fully on, or shortly before, to turn on the control devices of the second group and increase their conduction toward saturation as a function of the control input as that input continues to increase. Electronic means may be employed to generate control signals. The system may be used for I-V characteristic measurements of solar arrays, as well as for other load control purposes. NASA

**N83-17806*#** Computer Sciences Corp., Silver Spring, Md.
**RADAR ALTIMETRY SYSTEMS COST ANALYSIS**
David Escoe, F. T. Heuring, and William F. Denman Jan. 1976 127 p refs
(Contract NAS6-2369)
(NASA-CR-168341; NAS 1.26:168341; CSC/TR-76/6002) Avail: NTIS HC A07/MF A01 CSCL 09C

This report discusses the application and cost of two types of altimeter systems (spaceborne (satellite and shuttle) and airborne) to twelve user requirements. The overall design of the systems defined to meet these requirements is predicated on an unconstrained altimetry technology; that is, any level of altimeter or supporting equipment performance is possible. Author

**N83-17807#** Luigs (W.) und Neumann (G.), Ratingen (West Germany).
**MEASURING SYSTEM FOR HIGH-POWER CIRCUIT BREAKER Final Report, May 1980**
Anton Minnich Bonn Bundesministerium fuer Forschung und Technologie Sep. 1982 17 p In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie

(BMFT-FB-T-82-164; ISSN-0340-7608) Avail: NTIS HC A02/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 3,50

A complete system for measurement, storage and registration of all adequate data of a high power circuit breaker necessary for the evaluation of its characteristics was developed. The advantage of the measuring system lies mainly in the contactless coupling and high resolution of the measurement recorder. A piezoelectric recorder is for measuring the pressure. All analogue data is digitalized and stored in 12 bit words. Registration is done by an X-Y recorder or metalized paper recorder. Author

**N83-17808#** Ecole Nationale Superieure des Telecommunications, Paris (France). Dept. of Electronique et Physique.

**STUDY AND CONCEPTION OF A MODEL TO SIMULATE CHARGED TRANSFER DEVICES AT SURFACE IN VOLUME Ph.D. Thesis [ETUDE ET REALISATION D'UN MODELE POUR LA SIMULATION DES DISPOSITIFS A TRANSFERT DE CHARGE EN SURFACE ET EN VOLUME]**

Lis Karen Nanver Jun. 1982 216 p refs In ENGLISH and FRENCH Sponsored by Thomson CSF, Saint-Egreve, France

(ENST-E-82006) Avail: NTIS HC A10/MF A01

The development of a computer program which services a theoretical aid in the design of a change coupled device (CCD) imagers and filters. Any complete CCD includes a large number of combustions of conductor - oxide semiconductor and conductor - semiconductor structures. The CCD can be operated in a variety of ways. The mathematical basis of standard CCD potential and charge transfer simulation is presented. The theoretical model for transient analysis is described. The potential calculations the truncations of fourier series influence CCD surfaces. A basic mathematical to develop a method which supplies the required generality. TRANCH was developed and applications are presented. The potentials of TRANCH and extensions of the program are confirmed. Author

**N83-17809#** Stanford Univ., Calif. Dept. of Computer Science.

**COMBINING STATE MACHINES AND REGULAR EXPRESSIONS FOR AUTOMATIC SYNTHESIS OF VLSI CIRCUITS**

Jeffrey D. Ullman Sep. 1982 15 p refs

(Contract MDA903-80-C-0107)

(AD-A121214; SU-STAN-CS-82-927) Avail: NTIS HC A02/MF A01 CSCL 09/5

We discuss a system for translating regular expressions into logic equations or PLA's, with particular attention to how we can obtain both the benefits of regular expressions and state machines as input languages. An extended example of the method is given, and the results of our approach are compared with hand design; in this example we use less than twice the area of a hand-designed, machine optimized PLA. GRA

**N83-17810#** Naval Research Lab., Washington, D. C.

**EFFECTS OF PARTIAL SUPPRESSION OF ION EMISSION IN MODERATE IMPEDANCE DIODES Interim Report**

Robert J. Barker and Shyke A. Goldstein 30 Sep. 1982 35 p refs

(DNA Proj. T99-QAX)

(AD-A121309; NRL-MR-4915) Avail: NTIS HC A03/MF A01 CSCL 12/1

Numerical simulations have been completed testing the effects of partial ion emission suppression in 4-5 ohm pulsed power diodes. They were conducted to obtain physical insight into the results of a series of parallel experiments conducted on the Gamble II machine at NRL. A standard axial diode with a 3.0 cm outer radius hollow cathode and an electron reflexing anode foil was found to operate at 1.8 MV and 4.8 ohm with an effective ion efficiency of 0.32. Suppressing ion emission along the anode foil beyond a radius equal to the inner radius of the hollow cathode raised the diode impedance at the same voltage to 6.7 ohm and lowered the effective ion efficiency to 0.29. Decreasing the anode-cathode (A-K) gap from 5.0 mm to 3.5 mm and retaining the same degree of ion emission suppression lowered the impedance again in 4.8 ohm and returned the effective ion efficiency again to 0.32. That efficiency is in good agreement with the experimental findings for the same 3.5-mm gap case but is 0.03-0.07 higher than that experimentally observed for the 5.0-mm gap without ion emission suppression. The discrepancy may be actual or it may be due to a return electron current which masks some of the experimentally observed ion current for that case. Author (GRA)

**N83-17811#** State Univ. of New York, Stony Brook. Dept. of Electrical Engineering.

**INFINITE ELECTRICAL NETWORKS AND TRANSISTOR MODELING Final Report, 15 Jun. 1979 - 14 Sep. 1982**

Armen H. Zemanian Sep. 1982 8 p

(Grant AF-AFOSR-0205-80; AF Proj. 2304)

(AD-A121286; AFOSR-82-0922TR) Avail: NTIS HC A02/MF A01 CSCL 09/5

The theory and applications of infinite electrical networks are investigated. Methods were devised for computing the currents and voltages in uniform and non-uniform, grounded and ungrounded semi-infinite electrical grids. These results were applied to the numerical simulation of bipolar transistors and to the computational techniques arising in geophysical exploration. A complete and rigorous theory for infinite lumped transmission lines was at last achieved by closing a long-standing lacuna, and this was extended to ladder networks whose parameters are operators on a Hilbert space. A parametric representation for a general class of linear time-varying systems was devised. A new matroid for a certain class of infinite graphs was discovered. Author (GRA)

**N83-17812#** Edgerton, Germeshausen and Grier, Inc., Salem, Mass.

**NANOSECOND PULSER THYRATONS Interim Report, 1 Aug. - 30 Dec. 1981**

Steven Friedman Fort Monmouth, N.J. Army Electronics Research and Development Command Aug. 1982 36 p refs

(Contract DAAK20-80-C-0282; DA Proj. 1L1-62705-AH-94)

(AD-A121575; DELET-TR-80-0282-3) Avail: NTIS HC A03/MF A01 CSCL 09/1

A modified version of the HY-3013L thyratron has demonstrated substantially greater voltage holdoff and reduced triggering requirements. New recovery measurements, with circuitry designed to eliminate false triggering of the pulsed voltage sources, have yielded de-ionization times well within the 50 microsec required for 20kHz operation, at voltages and pressures well beyond those needed to meet the load voltage rise time and pulse width requirements. An instant-start dispenser cathode suitable for use with HY-3013L-type thyratrons has been developed and tested successfully in similar tubes. An ultra low inductance PFN/load combination has been constructed, and has produced a smooth 3.5ns FWHM multi-kilovolt pulse across a nominal 50pf load capacitance when switched via a short air gap. The kapton capacitors and ceramic resistor load shunt are theoretically capable of operating at around 200 watts average power. Three saturable reactor materials have been evaluated theoretically: orthonol, metglas and ferrite. Of these, only ferrite appears usable on a 10ns time scale, metglas and orthonol being unsuitable because of their low resistivity. Finally, a 20kHz kit has been constructed for high prr testing of the assembled nanosecond pulser circuit. GRA

**N83-17813#** General Electric Co., Syracuse, N.Y. Military Electronic Systems Operation.

**A SYNERGISTIC SOLUTION TO THE PROBLEM OF PACKAGING AND INTERCONNECTING VLSI/VHSIC CHIPS**

J. Charles Gioia Oct. 1982 33 p refs

(AD-A121587; R82EMH002) Avail: NTIS HC A03/MF A01 CSCL 09/1

Solutions are required for the many problems faced by the chip packaging and interconnection systems industry for effectively meeting the demanding application requirements of the rapidly emerging very-large scale integration/very-high speed integrated circuits (VLSI/VHSIC) chips. Present packaging technologies are

being stretched beyond their original concepts thus requiring a new approach to the problem solution. The Military Electronics Systems Operations (MESO) has developed a new packaging approach, based on the Direct Bond Copper Process, which addressed these problems providing a completely integrated system. The problem solution starts at the chip level where en masse connections are made to the chip, chip heat is more effectively managed, low-cost chip hermetic seals accomplished, and then continues providing improved means for interconnecting many VLSI/VHSIC chips. Author (GRA)

**N83-17814#** Los Alamos Scientific Lab., N. Mex.
**MECHANICAL DESIGN OF RFQ RESONATOR CAVITIES IN THE 400-MHz FREQUENCY RANGE**
L. D. Hansborough, J. M. Potter, and N. G. Wilson 1981 4 p refs Presented at the Linear Accelerator Conf., Santa Fe, N. Mex., 19-21 Oct. 1981
(Contract W-7405-eng-36)
(DE82-006126; LA-UR-81-3057; CONF-811083-20) Avail: NTIS HC A02/MF A01

Many RFQ resonator-cavity design concepts have been proposed in the 400-MHz frequency range. Los Alamos has been evaluating RFQ resonator-cavity designs that provide acceptable combinations of necessary mechanical features, easy tunability and long-term stability. Four RFQ resonator test cavities were fabricated to test rf joints between the RFQ vanes and the resonator cavity. Two of these joints (the C-seal and the rf clamp-joint) allow vane movement for tuning. These test data and the design of the present generation of RFQ resonator cavities, are presented. DOE

**N83-17815#** California Univ., Livermore. Lawrence Livermore Lab.
**STABILITY AND DISTURBANCE OF LARGE DC SUPERCONDUCTING MAGNETS**
S. T. Wang 11 Nov. 1981 24 p refs Presented at the Superconducting Magnet Cryostability Workshop for Helium 1 and Helium 2, Saclay, France, 16-19 Nov. 1981
(Contract W-7405-eng-48)
(DE82-006315; UCRL-86890; CONF-811140-3) Avail: NTIS HC A02/MF A01

The stability aspects of several dc superconducting magnets such as large bubble chamber magnets, and magnets for the Mirror Fusion Test Facility and MHD Research Facility are addressed. All of these magnets are cooled in pool boiling mode. Magnet design is briefly reviewed. The adopted stability criteria, analyses of stability and disturbance, stability simulation, and the final results of magnet performance, and the observed coil disturbances are discussed. DOE

**N83-17816#** Los Alamos Scientific Lab., N. Mex.
**NUMERICAL METHOD FOR DETERMINING ELECTRODE SHAPES FOR HIGH-PERVEANCE EXTRACTORS**
J. D. Schneider and D. D. Armstrong 1981 4 p refs Presented at the Linear Accelerator Conf., Santa Fe, N. Mex., 19-21 Oct. 1981
(Contract W-7405-eng-36)
(DE82-006134; LA-UR-81-3731; CONF-811083-26) Avail: NTIS HC A02/MF A01

The design of high-perveance extractors is dominated by the space-charge forces in the beam and by the aberrations caused by fringing fields at the apertures. Computer programs were developed for various extractor geometries that incorporate these effects. Basically the approach was to find a Laplace solution, external to the beam, that matches smoothly to the Child-Langmuir potential distribution in a laminar-flow ion beam. The electrode shapes calculated are not unique but do provide the desired beam optics. The application of this technique to the development of electrodes for a 250-mA, 75-keV hydrogen-ion extractor is discussed. For this application spherical geometry was used. The beam obtained was of high quality, that is, low emittance and small angular divergence. DOE

**N83-17817#** California Univ., Livermore. Lawrence Livermore Lab.
**FLASHLAMP WITH A DISCHARGE IN METAL VAPOR**
Yu. A. Martsinkovsskii Oct. 1981 4 p Transl. into ENGLISH of Russian Patent no. 410489 (17 Nov. 1972) 4 p
(Contract W-7405-eng-48)
(DE82-002147; UCRL-Trans-11729) Avail: NTIS HC A02/MF A01

A flashlamp using a discharge in metal vapor is described which is characterized by the fact that a halide of an alkali metal is introduced into a solid amalgam in order to expand the range of wavelengths where there is enhanced intensity of luminescence in individual spectral regions. DOE

**N83-17818#** Sandia Labs., Albuquerque, N. Mex.
**ELECTRONIC PROPERTIES OF ZnO VARISTORS: A NEW MODEL**
G. E. Pike 1981 18 p refs Presented at a Symp. on Grain Boundaries in Semicond., Boston, 15 Nov. 1981
(Contract DE-AC04-76DP-00789)
(DE82-005799; SAND-81-1908C; CONF-811178-1) Avail: NTIS HC A02/MF A01

Much of the research on ZnO varistors has concentrated on the explanation of their dc current-voltage characteristics. However, varistors also have unusual ac properties which can be technologically important, and must be described by any comprehensive model. In an ideal varistor with identical grain boundaries throughout, there should be no dispersive capacitance at zero bias. In real varistors this capacitance varies considerably with frequency. This dispersion has two causes, charge trapping in the depletion regions and differing grain boundary barriers. Calculations for each process are given. As the voltage across the varistor is increased, the low frequency capacitance is observed to increase well below the breakdown voltage. At even higher voltages the capacitance turns over and becomes negative. All of these effects can be described with a double depletion layer/thermionic emission model. DOE

**N83-17819#** General Electric Co., Schenectady, N. Y. Electric Utility Systems Engineering Dept.
**CONTROL OF MULTITERMINAL HVDC SYSTEMS EMBEDDED IN AC NETWORKS. VOLUME 1. METHODOLOGIES FOR CONTROL SYSTEM DESIGN Final Report, Oct. 1978 - May 1982**
R. L. Hauth, F. Nozari, J. R. Winkelman, M. Athans, and S. M. Chan 28 May 1982 191 p refs Prepared in cooperation with MIT 2 Vol.
(Contract DE-AC01-78RA-03395)
(DE82-021168; DOE/RA-03395/T1-Vol-1) Avail: NTIS HC A09/MF A01

Control concepts applicable to future multiterminal high voltage dc (MTDC) networks embedded in bulk power ac systems are discussed. The control's objectives are to enhance the steady state and/or dynamic performance of the integrated MTDC/ac power system. A multi-terminal HVdc system is one with more than two converter terminals. The three basic control levels of an MTDC system are: primary control, supplementary power modulation (damping) controls, and dispatch control. Techniques for use in all three levels of control are described. The application of modern control robustness theories to the MTDC power modulation control design methodology is discussed. DOE

**N83-17820#** Massachusetts Inst. of Tech., Cambridge. Lab. for Information and Decision Systems.
**CONTROL OF MULTITERMINAL HVDC SYSTEMS EMBEDDED IN AC NETWORKS. VOLUME 2. ROBUSTNESS OF MULTIVARIABLE CONTROL SYSTEMS Final Report, Oct. 1978 - May 1982**
Michael Athans, Wing-Hong Lee, Norman A. Lehtomaki, Bernard C. Levy, and Peng-Teng P. Ng Schenectady, N.Y. General Electric Co. 28 May 1982 115 p refs Sponsored in part by General Electric Co. 2 Vol.
(Contract DE-AC01-78RA-03395)

(DE82-021167; DOE/RA-03395/T1-Vol-2) Avail: NTIS HC A06/MF A01

The robustness of the stability of multivariable linear time-invariant feedback control systems with respect to model uncertainty is considered using frequency domain criteria. Available and new robustness tests are unified under a common framework based on the nature and structure of model errors. These results are derived using a multivariable version of Nyquist's stability theorem in which the minimum singular value of the return difference transfer matrix is shown to be the multivariable generalization of the distance to the critical point of a single-input, single-output (SISO) Nyquist diagram. Using the return difference transfer matrix a very general robustness theorem is presented from which all of the robustness tests dealing with specific model errors may be derived. The robustness of linear-quadratic-Gaussian control systems are analyzed via this robustness theory and multiloop stability margins are presented; in particular, a new type of margin, a cross-feed margin, is introduced. Other frequency domain analysis and design techniques are also briefly discussed and their relation to the present robustness analysis is examined. In addition a linear-quadratic based design procedure that quarantees a prescribed degree of stability is developed, with special emphasis upon its robustness properties. DOE

**N83-17821#** Los Alamos Scientific Lab., N. Mex.
**RACETRACK MICROTRON RADIO-FREQUENCY SYSTEM**
Paul J. Tallerico and A. K. Mitra 1981 4 p refs Presented at the Linear Accelerator Conf., Santa Fe, N. Mex., 19-21 Oct. 1981
(Contract W-7405-eng-36)
(DE82-010536; LA-UR-81-3059-Rev; CONF-811083-29-Rev) Avail: NTIS HC A02/MF A01

The design and construction progress of a prototype RF system to drive the Los Alamos-NBS racetrack microtron electron accelerator is described. The RF system requires 450 kW CW at 2380 MHz from a single klystron. The output from the klystron is split three ways to drive a capture section, a preaccelerator section, and the main accelerator section. The fields in each section are phase- and amplitude-controlled to tight tolerances. Temperature control of the accelerator sections also is linked to the amplitude-control system, because the system's average power is so high. DOE

**N83-17822#** Sandia Labs., Albuquerque, N. Mex.
**A SUPERREGENERATIVE AMPLIFIER IN LINEAR MODE AS A RADAR RANGE GATE**
Charles S. Williams Sep. 1982 36 p refs
(Contract DE-AC04-76DP-00789)
(DE83-001660; SAND-82-1424) Avail: NTIS HC A03/MF A01

A formula for the output voltage of a superregenerative amplifier in linear mode when used as a radar range gate is outlined. The formula is applicable to transients and can be used to find the gate response to radar echo pulses at ranges different from the range of maximum gate response. Radar echo as well as noise and jamming are often random processes, and formulas for the mean square output when the input is a stationary or transient random process are given. The relationships among amplification, gatewidth, and bandwidth are presented. DOE

**N83-17823#** General Electric Co., Schenectady, N. Y. Energy Systems Programs Dept.
**ELECTROSTATIC GRANULAR BED FILTER DEVELOPMENT PROGRAM Quarterly Technical Report, Jul. - Sep. 1981**
31 Dec. 1981 26 p Sponsored in part by the New York State Energy Research and Development Authority
(Contract DE-AC21-79ET-15490)
(DE82-005287; DOE/ET-15490/T12; FE-5490-29) Avail: NTIS HC A03/MF A01

An electrostatic granular bed (EGB) filtration for pressurized fluidized bed combined cycle application was developed. Experiments provide the data necessary to design a hot test model and to perform systems integration and economic evaluation studies. Based on the laboratory results, preliminary engineering estimates of the capital and operating costs are provided for the selected approach. In parallel with the electrostatic granular bed filter testing, laboratory scale experiments and engineering assessments are performed for two concepts for removing corrosive alkali metal vapor from the combustion gases. An instrumentation plan was developed for the AFB model filter test. A filter as delivered and installed in the AFB facility, and testing began with molochite, limestone, sandy gravel, and coal. During attempted 100-hr tests, dust loadings of baghouses downstream of the EGB filter were measured. DOE

**N83-17824#** Total Environmental Action, Inc., Harrisville, N.H.
**RESIDENTIAL-APPLIANCE LOAD CHARACTERISTICS**
Joseph Kohler Apr. 1982 75 p
(Contract DE-AC02-77CH-00178; EG-77-C-01-4042)
(DE82-012883; SERI/TR-11095-1) Avail: NTIS HC A04/MF A01

The performance of residential photovoltaic systems in combination with energy efficient appliances is examined. The load characteristics are presented for several types of major residential appliances. Load characteristics consist of the average energy use of each appliance, the power demand while the appliance is operating, and a typical use schedule. Potential energy conserving features are investigated for each appliance and used to identify a best available model and maximum feasible energy efficient appliance. Load characteristics of these energy conserving designs are then compared with the load characteristics of a standard model. The feasibility of converting appliances to dc power for use with photovoltaic systems is also discussed. DOE

**N83-17763#** Joint Publications Research Service, Arlington, Va.
**EXPOSITION WILL DISPLAY INNOVATIVE FRG ELECTRONICS**
Heinz Friedberg and Siegfried W. Best *In its* West Europe Rept.: Sci. and Technol., No. 134 (JPRS-82686) 20 Jan. 1983 p 14-28 Transl. into ENGLISH from Elektron. Ind. (West Germany), 3 Nov. 1982 p 12, 13, 15, 18, 23, 24, 26, 28 (For primary document see N83-17761 08-31)
Avail: NTIS HC A05/MF A01

**N83-17764#** Joint Publications Research Service, Arlington, Va.
**EUROPEAN SEMICONDUCTOR INDUSTRY: MARKETS, GOVERNMENT PROGRAMS**
Achim Scharf *In its* West Europe Rept.: Sci. and Technol., No. 134 (JPRS-82686) 20 Jan. 1983 p 29-48 Transl. into ENGLISH from Elektron.-Appl., Elektron.-Intern. Suppl. (West Germany), Sep. 1982 p 13-21 (For primary document see N83-17761 08-31)
Avail: NTIS HC A05/MF A01

# 34 FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.

For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics.*

**N83-17825** British Aerospace Aircraft Group, Warton (England). Theoretical Fluid Mechanics Section.
**THE BAE WARTON MK. 2 PANEL PROGRAM SYSTEM: USERS GUIDE. VOLUME 4: MK 22D PROGRAM**
G. D. Jones Apr. 1982 53 p
(BAE-AE/431-Vol-4) Copyright. Avail: Issuing Activity

The input/output facilities of the MK. 2 2D program are described. The program was written to simulate the 3D program. Some 3D features are not available. These include motion, output of derivatives and the local solution improvement technique. The 2D program also uses a direct solution rather than an iterative method in the evaluation of the singularity weights. The program has an axisymmetric option. It is found that the program is a useful tool in the prediction of aerodynamic properties. It forms a useful teaching aid for the 3D program in that the keyword logic,

singularity location and closure options are the same as in the 3D program. E.A.K.

**N83-17826** British Aerospace Aircraft Group, Warton (England). Applications Development Section.
**THE PLOTTING OF LOCAL FLOW ANGLES USING THE WARTON MK. 2 PANEL PROGRAM SUITE: A USER GUIDE**
P. A. Mair Jul. 1982 18 p ref
(BAE-AE/A/730) Copyright. Avail: Issuing Activity

A facility for plotting local flow angles using flow field data calculated by the Warton Mk. 2 panel program suite is described. The creation of flow field data using the Mk. 2 panel program and the use of program FLOANG (Warton program number ETOD94A), which calculates the flow angles and plots them are discussed. Both local pitch (alpha) and yaw (beta) flow angles are plotted by the program. S.L.

**N83-17827** Netherlands Organization for Applied Scientific Research TNO, Delft. Inst. for Mechanical Constructions.
**COMPUTATION OF MASS FLOW RATES AND PRESSURE LOSSES IN BRANCHED PIPELINE NETWORKS**
J. A. Miedema and B. Q. M. Westgeest Nov. 1981 32 p refs In ENGLISH; DUTCH summary Sponsored by Netherlands Royal Navy
(Contract A80/KM/086; TNO Proj. 5173202)
(Rept-5173202-81-1) Avail: Issuing Activity

A computer program calculating the mass flow rates and the pressure losses in the branches of a branched pipeline network is discussed. The program assumes a quadratic relation between the mass flow rate and the pressure loss in a branch. A set of equations containing the unknown mass flow rates is solved with the aid of the Newton-Raphson iteration method. The program was tested on two cooling system networks. Author

**N83-17828** Max-Planck-Inst. fuer Quantenoptik, Munich (West Germany).
**SELFSIMILAR SPHERICAL COMPRESSION WAVES IN GAS DYNAMICS**
J. Meyer-ter-Vehn and C. Schalk May 1982 49 p refs Submitted for publication Sponsored by Bundesministerium fuer Forschung und Technologie and Euratom
(MPQ-62) Copyright. Avail: Issuing Activity

A synopsis of different selfsimilar spherical compression waves is given pointing out their fundamental importance for the gas dynamics of inertial confinement fusion. Strong blast waves, various forms of isentropic collapsing hollow spheres are included. A classification is given in terms of six singular points which characterize the different solutions and the relations between them. The presentation closely follows Guderley's original work on imploding shock waves. Author

**N83-17829*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
**COMPUTATION OF TRANSONIC VISCOUS-INVISCID INTERACTING FLOW**
D. L. Whitfield (Mississippi State Univ., Mississippi State), J. L. Thomas, A. Jameson (Princeton Univ., Princeton, N.J.), and W. Schmidt (Dornier GmbH, Friedrichshafen, West Germany) [1982] 6 p refs
(NASA-TM-85203; NAS 1.15:85203) Avail: NTIS HC A02/MF A01 CSCL 20D

Transonic viscous-inviscid interaction is considered using the Euler and inverse compressible turbulent boundary-layer equations. Certain improvements in the inverse boundary-layer method are mentioned, along with experiences in using various Runge-Kutta schemes to solve the Euler equations. Numerical conditions imposed on the Euler equations at a surface for viscous-inviscid interaction using the method of equivalent sources are developed, and numerical solutions are presented and compared with experimental data to illustrate essential points. Author

**N83-17830#** National Aerospace Lab., Tokyo (Japan).
**THE PROPERTIES OF CONSTANT DENSITY TURBULENT JET AND TURBULENCE MODELS**
Hiroshi Ishigaki Jun. 1982 11 p refs In JAPANESE; ENGLISH summary
(NAL-TR-714; ISSN-0389-4010) Avail: NTIS HC A02/MF A01

The properties of a turbulent jet issued into still fluid of the same density, are derived analytically through the assumptions that: (1) mean velocity profile can be represented by Gaussian error curve, and (2) jet half width is independent of exit conditions. Both plane and round jets are treated, and formulas on center line velocity, entrainment, and others are derived. Center line velocity is much influenced by the exit conditions, especially by jet exit geometry. An exit momentum factor is introduced to correlate center line velocity, and approximate values are given for practical flows. Typical turbulence models are examined from the point of view of jet turbulence structure. S.L.

**N83-17831#** National Aerospace Lab., Kakuda (Japan).
**AN IMPLICIT FINITE-DIFFERENCE METHOD FOR CHEMICAL NONEQUILIBRIUM FLOW THROUGH AN AXISYMMETRIC SUPERSONIC NOZZLE**
Kazuhiro Nakahashi Mar. 1982 15 p refs
(NAL-TR-705T; ISSN-0389-4010) Avail: NTIS HC A02/MF A01

A second order accurate, noniterative, implicit procedure is developed for the stiff system of equations of a two dimensional chemical reacting supersonic flow. All equations are solved simultaneously at each grid point by treating the axial derivative terms implicitly, in order to make the scheme stable with respect to the chemical rates. By treating the radial derivative terms explicitly, the scheme becomes simple and has the advantage that only a relatively small computer storage is required. The computational efficiency is compared by investigating the arithmetic operational counts required to solve a linear algebraic equation system constructed in each implicit scheme. It is demonstrated that, although the marching step size of the proposed scheme is restricted due to the explicit treatment of radial derivative terms, the computational efficiency of the proposed scheme is superior to those of other schemes, especially for problems involving a large number of chemically reacting species. The practical computational time of the proposed scheme is also compared with that of an existing explicit implicit method. M.G.

**N83-17832*#** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
**ON THE STRUCTURE OF WALL-BOUNDED TURBULENT FLOWS**
John Kim Feb. 1983 49 p refs
(NASA-TM-84313; A-9179; NAS 1.15:84313) Avail: NTIS HC A03/MF A01 CSCL 20D

The variable-interval time-averaging (VITA) technique developed by Blackwelder and Kaplan is applied to data obtained from large-eddy simulation of turbulent channel flow in an investigation of the organized structures associated with the bursting phenomenon in the near-wall region. Conditionally averaged velocities, shear stress, pressure, and vorticity are discussed in conjunction with the bursting phenomenon detected by the VITA technique. The conditionally averaged pressure reveals that the ejection process is associated with a localized adverse pressure gradient. In the plane perpendicular to the flow direction, the conditionally averaged vorticity field indicates that a pair of counterrotating streamwise vorticity is being lifted through the ejection process. M.G.

**N83-17833*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
**EXPERIMENTAL INVESTIGATION OF THE VAPOROUS/GASEOUS CAVITY CHARACTERISTICS OF AN ECCENTRIC JOURNAL BEARING**
M. J. Braun and R. C. Hendricks Oct. 1982 15 p refs Presented at the Joint Lubrication Conf., Washington, 4-6 Oct. 1982 Previously announced as A83-13230
(NASA-TM-82996; E-1429; NAS 1.15:82996) Avail: NTIS HC A02/MF A01 CSCL 20D

For abstract see A83-13230.

**N83-17834*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
**FINITE ELEMENT FORMULATION FOR TRANSIENT HEAT TREAT PROBLEMS**
R. L. Mullen (Case Western Reserve Univ.) and R. C. Hendricks 1983 9 p refs Proposed for presentation at the Thermal Eng. Joint Conf., Honolulu, Hawaii, 20-24 Mar. 1983; sponsored by ASME and the Japan Society of Mechanical Engineers
(NASA-TM-83070; E-1520; NAS 1.15:83070) Avail: NTIS HC A02/MF A01 CSCL 20D

The macrothermomechanical behavior of materials subjected to rapid thermal or mechanical loading such as occurs in most heat treatments is described. The equations are developed for Lagrangian, Eulerian, and intermediary kinematic descriptions and are independent of the constitutive laws and the equation of state; they can be solved numerically for a specified material and boundary conditions. The coupled transport effects between dissipation and energy are included. The conventional linearized stability approach indicates the numerical procedure to be stable, with certain restriction on the time step size. S.L.

**N83-17835#** Imperial Coll. of Science and Technology, London (England).
**TURBULENT VORTEX FLOWS Final Report, Oct. 1978 - Sep. 1981**
P. Bradshaw, I. M. M. A. Shataka, and R. D. Mehta Mar. 1982 200 p refs
(Contract N00014-78-G-0032; NR Proj. 061256)
(IC-AERO-TN-102) Avail: NTIS HC A09/MF A01

Mean and fluctuating velocity measurements in three types of longitudinal vortex imbedded in turbulent boundary layers in nominally zero pressure gradients are presented. Vortex generators were installed upstream of the wind tunnel contraction, so that the vortices entering the working section did not have large associated total pressure wakes. Measurements include all three components of mean velocity, all second and third order (and a few fourth order) mean products of fluctuating velocities, and surface shear stress, all for at least two streamwise positions for each configuration. Temperature conditioned sampling measurements, and some flow visualization results, were also acquired. S.L.

**N83-17836#** Indian Inst. of Tech., Kanpur. Dept. of Aeronautical Engineering.
**A COMPARATIVE STUDY OF STEADY STATE AND TIME-ASYMPTOTIC NAVIER-STOKES SOLUTIONS UNDER HYPERSONIC RAREFIED CONDITIONS**
A. C. Jain Aug. 1982 33 p refs Presented at the Workshop-Cum-Seminar on Computational Fluid Mech., Trivandrum, India, 14-21 June 1981, and at the 13th Intern. Symp. of Space Technol. and Sci., Tokyo, 28 Jun. - 3 Jul. 1982 Sponsored by the Dept. of Space, Government of India
Avail: NTIS HC A03/MF A01

Hypersonic merged layer flow near the stagnation point of a blunt body was investigated through the numerical solution of steady state Navier-Stokes equations and time asymptotic solution of unsteady Navier-Stokes equations. A Monte Carlo technique gives results for the early stage of the formation of merged shock layer regime. A detailed comparison of steady state Navier-Stokes solutions and time asymptotic solutions of unsteady Navier-Stokes equations with the corresponding results from Monte Carlo technique and the experimental data was made. Comparison from various studies on the Galileo probe is presented. S.L.

**N83-17837*#** Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Engineering Science and Mechanics.
**UNSTEADY BOUNDARY-LAYER INJECTION Final Report**
D. P. Telionis and G. S. Jones Aug. 1981 37 p refs
(Contract NAG1-146)
(NASA-CR-169865; NAS 1.26:169865; VPI-E-81-23) Avail: NTIS HC A03/MF A01 CSCL 20D

The boundary-layer equations for two-dimensional incompressible flow are integrated numericaly for the flow over a flat plate and a Howarth body. Injection is introduced either impulsively or periodically along a narrow strip. Results indicate that injection perpendicular to the wall is transmitted instantly across the boundary layer and has little effect on the velocity profile parallel to the wall. The effect is a little more noticeable for flows with adverse pressure gradients. Injection parallel to the wall results in fuller velocity profiles. Parallel and oscillatory injection appears to influence the mean. The amplitude of oscillation decreases with distance from the injection strip but further downstream it increases again in a manner reminiscent of an unstable process. M.G.

**N83-17838*#** Cambridge Hydrodynamics, Inc., Mass.
**NUMERICAL STUDIES OF LAMINAR AND TURBULENT DRAG REDUCTION, PART 2**
R. Balasubramanian and S. A. Orszag Washington NASA Jan. 1983 91 p refs
(Contract NAS1-16722)
(NASA-CR-3669; NAS 1.26:3669; CHI-75-Pt-2) Avail: NTIS HC A05/MF A01 CSCL 20D

The flow over wave shaped surfaces is studied using a Navier Stokes solver. Detailed comparisons with theoretical results are presented, including the stability of a laminar flow over wavy surfaces. Drag characteristics of nonplanar surfaces are predicted using the Navier-Stokes solver. The secondary instabilities of wall bounded and free shear flows are also discussed. S.L.

**N83-17839#** Kloeckner Wilhelmsburger G.m.b.H., Georgsmarienhuette (West Germany). Behaelter- und Apparatebau.
**DEVELOPMENT, UP TO THE CONSTRUCTION STAGE OF A QUASILIQUID SURFACE STORAGE, IN PARTICULAR FOR A LIQUID GAS, BALL THRUST CONTAINER Final Report, Nov. 1981**
Erhard Frese and Walter Averdiek Bonn Bundesministerium fuer Forschung und Technologie Sep. 1982 234 p refs In GERMAN, ENGLISH summary Sponsored by Bundesministerium fuer forschung und Technologie
(BMFT-FB-T-82-159; ISSN-0340-7608) Avail: NTIS HC A11/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 40

The strain and buckling behavior of spherical pressure vessels with special ground support was investigated. Improvements of construction and fabrication of pressure vessels with regard to strain and stress conditions is examined. E.A.K.

**N83-17840#** Steinmueller (L. und C.) G.m.b.H., Gummersbach (West Germany). Fachbereich Umwelttechnik.
**DEVELOPMENT OF HEAT EXCHANGERS FOR REHEATING SCRUBBED FLUE GAS IN A PILOT PLANT Final Report, Jun. 1981**
Stanislaw Michalak Bonn Bundesministerium fuer Forschung und Technologie Sep. 1982 89 p In GERMAN; ENGLISH summary Sponsored by Bundeministrium fuer Forschung und Technologie
(BMFT-FB-T-82-169; ISSN-0340-7608) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 18,50

Application of some reheating systems in flue gas desulphurization plants was studied. The following problems are examined: the influence of solid impurities in gas on the heat transfer coefficient, the different operational conditions to test clearing of the heat transfer surface, the rate of corrosion, and the partial gas recirculation. Measurements to increase the heat transfer coefficient and removing of liquid drops are suggested. Measurement techniques, insulation and prevention of leakage are discussed. E.A.K.

**N83-17841#** STEAG A.G., Essen (West Germany). Research and Development Dept.
**TESTING OF HEAT EXCHANGER SYSTEMS FOR REHEATING FLUE GASES FROM WET SCRUBBING DESULFURIZATION PLANTS Final Report, Dec. 1980**
Kyaw Than Bonn Bundesministerium fuer Forschung und Technologie Sep. 1982 128 p refs In GERMAN; ENGLISH

summary Sponsored by Bundesministerium fuer Forschung und Technologie Prepared in cooperation with Vereinigte Elektrizitaetswerke Westfalen AG
(BMFT-FB-T-82-170; ISSN-0340-7608) Avail: NTIS HC A07/MF A01; Fachinformationszentrum, Karlsruhe, West Germay DM 27

Two heat exchanger systems: the cyclic process of GEA and, the plate heat exchanger of Kablitz/Thyssen, for reheating flue gases, which have been cooled to about 50 to 55 C due to wet scrubbing, to the required temperature at the outlet of the stack by extracting the sensible heat of the hot flue gases were tested. The problem of building materials and on keeping clean the heat exchanger surface are emphasized. E.A.K.

**N83-17842#** Essen Univ. (West Germany). Inst. fuer Energie- und Kraftwerkstechnik.
**PRACTICAL AND THEORETICAL ANALYSIS OF CONTINUOUS SELECTION OF TEMPERATURE LAYERS IN A HOT TANK BY AN EXPERIMENTAL TANK AND A SIMULATION MODEL Final Report, Aug. 1981**
Manohar Patil and Peter Wensierski Bonn Bundesministerium fuer Forschung and Technologie Sep. 1912 161 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-82-171; ISSN-0340-7608) Avail: NTIS HC A08/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DN 32,50

The stabilization and the behavior of stratifications were investigated and experimantal data were recorded. In a hot water tank with special moving fixtures for charging and discharging, which control the thermal stratifications intentionally and continuously. The dynamic performance of such a type of storage tank for a conventional tank, for which a computer calculating model were developed. The limitations of using these stratifications in such storage tanks for space heating and hot water preparation are shown. Advantages and disadvantages of stratified tanks with continuous control are compared with those of conventional tanks. The results are documented with the help of diagrams and tables. E.A.K.

**N83-17843#** Imperial Coll. of Science and Technology, London (England). Computational Fluid Dynamics Unit.
**NUMERICAL REQUIREMENTS OF PWR THERMAL-HYDRAULIQUE PREDICTIONS: SOME SIMPLE EXAMPLES**
D. Brian Spalding Oct. 1982 60 p refs
(CFD/82/13) Avail: NTIS HC A04/MF A01

The validity of thermal-hydraulic predictions made by computer codes depends upon the suitability of numbers of grid cells, time steps and iterations. Two phenomena are examined in some detail: the expulsion of a liquid from a vertical tube by a gas injected from below and the quenching of a hot metal tube by coolant forced through it from one end. Predictions of these processes were made with the help of the PHOENICS code, which allows the numerical factors to be varied through wide ranges without excessive computer costs. It is shown that finer grids, shorter time steps and more numerous iterations are needed, for good numerical accuracy, than are commonly employed in pressurized water reactors safety calculations. It is further argued that, since the grid, time-step and iteration settings which are needed for accuracy differ greatly from case to case, all thermal-hydraulic predictions of any importance should be subjected to numerical studies of the present kind. R.J.F.

**N83-17844#** Karlsruhe Univ. (West Germany). Ausbreitungs- und Transportvorgaenge in Stroemungen.
**NUMERICAL CALCULATION OF STEADY THREE DIMENSIONAL TURBULENT JETS IN CROSS FLOW**
A. O. Demuren May 1982 40 p refs Sponsored by the German Research Foundation (DFG)
(KU-SFB-81/T/209) Avail: NTIS HC A03/MF A01

Calculations of the steady flow of a row of turbulent jets issuing normally into a nearly uniform cross flow are presented. Using three dimensional finite difference numerical procedures. One procedure uses a quadratic upstream weighted (QUICK) difference scheme in representing the convection while the other uses a Hybrid central/upwind difference scheme. The calculations with the former are shown to be superior to those with the latter, for all grid distributions. Fine grid calculations, with the QUICK scheme are shown to agree fairly well with experimental measurements of total pressure distributions immediately downstream of the jet discharge. The agreement becomes worse further downstream, and it is shown that this may be due to the inability of the turbulence model to correctly reflect the complex turbulent structure in the wake region. Estimates are provided of the relative magnitudes of the three dimensional false or numerical diffusivities, resulting from the use of upwind differencing. ESA

**N83-17845#** United Technologies Research Center, East Hartford, Conn.
**ANALYSIS OF IMBEDDED TRANSONIC SHOCK WAVE INFLUENCE ON TURBULENT BOUNDARY LAYER SEPARATION Annual Report, 1 Apr. 1981 - 31 Aug. 1982**
J. E. Carter and M. M. Hafez Sep. 1982 63 p refs
(Contract F49620-81-C-0041; AF Proj. 2307)
(AD-A121299; UTRC/R82-91571201; AFOSR-82-0955TR) Avail: NTIS HC A04/MF A01 CSCL 20/4

A strong viscous-inviscid interaction model has been developed for predicting the detailed properties of the flow in the vicinity of an imbedded transonic shock wave interacting with a turbulent boundary layer in cases where the shock wave is of sufficient strength to result in flow separation. In this interaction model the inviscid flow is analyzed with a compressible stream function analysis specifically developed for mixed subsonic-supersonic flow regions. In the present effort this analysis has been extended to include upstream vorticity effects and the boundary-layer displacement effects. Numerous calculations are presented which demonstrates the capability of this analysis to predict transonic rotational flow. The viscous analysis in this interaction model is a newly developed inverse boundary-layer analysis which accounts for normal pressure gradients and imbedded shock waves. The equations are solved with a coupled implicit finite-difference scheme subject to the condition that the flow at the edge of viscous layer merges asymptotically with the outer inviscid flow. A model problem has been analyzed with this generalized inverse boundary-layer procedure and no stability problems were encountered. GRA

**N83-17846#** Army Armament Research and Development Command, Aberdeen Proving Ground, Md. Ballistic Research Lab.
**PRESSURE MEASUREMENTS OF A ROTATING LIQUID FOR IMPULSIVE CONING MOTION Final Report**
William P. D'Amico, Jr., William G. Beims, and Thomas H. Rogers Aberdeen Proving Ground, Md. Army Armament Research and Development Command Nov. 1982 49 p refs Supersedes IMR-735
(DA Proj. 1L1-62618-AH-80)
(AD-A121603; AD-F300111; ARBRL-MR-03208; IMR-735) Avail: NTIS HC A03/MF A01 CSCL 09/6

A spinning cylinder which contained a liquid in rigid body rotation was impulsively forced to cone at a small angle away from a vertical orientation. The response of the fluid to this abrupt, circular coning motion was measured by pressure transducers that were located in the end wall of the cylinder. The time for the fluid to achieve a steady state response to the impulsive coning motion was several seconds. Cone-up times were experimentally determined for a range of coning frequencies. The Reynolds number was 5.23 x 10 to the 5th power. In general, the cone-up times were comparable in magnitude to the spin-up time (the time required by the liquid to adjust to an impulsive change in the spin rate of the cylinder). These experiments indicate that numerical simulations for liquid payloads carried by spin-stabilized, gun launched projectiles must account for both spin-up and cone-up and that these effects must be treated simultaneously. GRA

**N83-17847#** Oak Ridge National Lab., Tenn. Energy Div.
**STEAM EJECTOR AS AN INDUSTRIAL HEAT PUMP**
H. G. Arnold, W. R. Huntley, and H. Perez-Blanco 1982 28 p

refs Presented at the Semiann. Meeting of ASHRAE, Houston, Tex., 24-28 Jan. 1982
(Contract W-7405-eng-26)
(DE82-010194; CONF-820112-8) Avail: NTIS HC A03/MF A01

The steam ejector is analyzed for use in industrial heat recovery applications and compared to mechanical compressor heat pumps. An estimated ejector performance was analyzed using methods based on conservation of mass, momentum, and energy; using steam properties to account for continuity; and using appropriate efficiencies for the nozzle and diffuse performance within the ejector. A potential heat pump application at a paper plant in which waste water was available in a hot well downstream of the paper machine was used to describe use of the stream ejector. Both mechanical compression and jet ejector heat pumps were evaluated for recompression of flashed steam from the hot well. It is noted that another possible application of vapor recompression heat pumps is the recovery of waste heat from large facilities such as the gaseous diffusion plants. The economics of recovering waste heat in similar applications is analyzed. DOE

**N83-17848#** Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.
**THE EFFECTS OF GRID TURBULENCE ON NONEQUILIBRIUM CHOKED-NOZZLE FLOW**
J. R. Fincke, D. R. Collins, and M. L. Wilson 1981 13 p refs Presented at the Winter Ann. Meeting of the ASME Technol. and Soc. Div., Washington, 15 Nov. 1981
(Contract DE-AC07-76ID-01570)
(DE82-005646; EGG-M-02481; CONF-811101-22) Avail: NTIS HC A02/MF A01

A number of experiments were conducted to investigate the role played by grid-produced turbulence on the nonequilibrium choking process in short nozzles with subcooled upstream conditions. Testing was conducted in a low pressure flow loop at a constant temperature of 75 C. Grids were placed upstream of the nozzle to alter the intensity and scale of turbulence. These changes were reflected in the degree of thermodynamic nonequilibrium in the nozzle and in the critical mass flux. It was found that the data were ordered logically by the turbulent integral-length scale. Subsequently, a nonequilibrium vapor generation model based on a description of the turbulent transport of thermal energy was developed. The vapor generation model was combined with conservation equations to define the critical flow condition. This model was then examined with respect to data available in the open literature. DOE

**N83-17849#** California Univ., Livermore. Lawrence Livermore Lab.
**COLLIDING DROPLETS: A SHORT FILM PRESENTATION**
C. D. Hendricks 22 Dec. 1981 5 p Presented at the 2nd Conv. of the Intern. Colloq. on Drops and Bubbles, Monterey, Calif., 19-21 Nov. 1981
(Contract W-7405-eng-48)
(DE82-005832; UCRL-86115; CONF-811174-3) Avail: NTIS HC A02/MF A01

A series of experiments were performed in which liquid droplets were caused to collide. Impact velocities to several meters per second and droplet diameters up to 600 micrometers were used. The impact parameters in the collisions vary from zero to greater than the sum of the droplet radii. Photographs of the collisions were taken with a high speed framing camera in order to study the impacts and subsequent behavior of the droplets. DOE

**N83-17850#** Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho. Code Development Div.
**NONEQUILIBRIUM FLASHING MODEL FOR RAPID PRESSURE TRANSIENTS**
F. Aguilar and S. Thompson (Babcock and Wilcox Co.) 1981 37 p refs Presented at the 20th Natl. Heat Transfer Conf., Milwaukee, 2 Aug. 1981
(Contract DE-AC07-76ID-01570)
(DE82-007639; CONF-810804-24) Avail: NTIS HC A03/MF A01

A detailed, microscopic model for the nonequilibrium flashing of water is coupled to equations describing the bulk liquid state in order to calculate rapid pressure response to an induced liquid strain. The flashing model is predicated on the dynamics of a single bubble growing in an infinite liquid, and it encompasses both the inertia and conduction-limited regimes of bubble growth. The analysis is valid at high temperatures. It is not limited by the assumption of a thin thermal boundary layer for the bubble or by a prescribed boundary layer shape. The analysis can predict arbitrary pressure transients, both decompressive and recompressive. The flashing model involves the solution of a system of ordinary and partial differential equations constituting a classic moving-boundary problem. The solution is obtained numerically by the method of lines and by the use of automatic software. DOE

**N83-17851#** Los Alamos Scientific Lab., N. Mex.
**NUMERICAL MODELING OF GUN EXPERIMENTS WITH IMPACT VELOCITIES LESS THAN SDT THRESHOLD: THERMAL EXPLOSION INITIATED BY FRICTION HEAT**
W. D. Barfield Jan. 1982 33 p refs
(Contract W-7405-eng-36)
(DE82-010903; LA-9054-MS) Avail: NTIS HC A03/MF A01

One and two dimensional calculations were made to model thermal explosion ignited by friction heat, hypothesized as an initiation mechanism for the unknown XDT phenomenon that is responsible for detonations observed in gun experiments with impact velocities less than threshold for shock to detonation transition. Preliminary results suggest that friction induced thermal explosion would be quenched by cooling associated with side rarefactions after penetrating only a thin layer of the propellant. Other effects would be expected to increase the calculated heating rates or speed up the friction induced thermal explosion. For this reason, friction cannot be ruled out as an initiation mechanism on the basis of the results described. DOE

**N83-17852#** Sandia Labs., Albuquerque, N. Mex. Energy Subsystems Div.
**MASS FLOW OF CHAR/COAL IN OXYGEN-BLOWN ENTRAINED-BED GASIFIERS: AN ASSESSMENT OF INSTRUMENTS AND METHODS OF MEASUREMENT**
John G. Castle, Jr. Dec. 1981 28 p refs
(Contract DE-AC04-76DP-00789)
(DE82-006988; SAND-81-1820) Avail: NTIS HC A03/MF A01

The mass flow in the feed lines of an entrained-bed gasifier is investigated. There are several promising techniques for the measurement of this mass flow. Four techniques that appear to be suitable for measuring mass flow in either coal or char feed lines are listed. A fifth, pulsed neutron activation, is included because of its potential as a calibration instrument. DOE

# 35 INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

For aerial photography see *43 Earth Resources.* For related information see also *06 Aircraft Instrumentation,* and *19 Spacecraft Instrumentation.*

**N83-17853** Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).
**HIGH SENSITIVE MASS SPECTROMETER WITH EXTREMELY LOW BACKGROUND NOISE ON ATOMIC MASSES 1 AND 2 [HOCHEMPFINDLISCHES MASSENSPEKTROMETER MIT EXTREM KLEINER UNTERGRUNDZAEHLRATE AUF DEN ATOMAREN MASSEN 1 UND 2]**
U. Schwalm Sep. 1982 40 p refs In GERMAN
(MPIS-10/1982; ISSN-0436-1199) Avail: Issuing Activity

A magnetic mass spectrometer is described. The system was build to measure the angle dependent scattering cross section of

the H(2) molecule system at very small pulsating energy. The scattering experiments release only very small signals. The LHe bath cryostat was elected for use in these measurements. Its advantages are that: all gases were pumped up, even at very low pressure, with the high specific vacuum speed; because of the cessation of the pump drive and lubricants a back diffusion in the container of hydrocarbons is avoided. Transl. by E.A.K.

**N83-17854*#** Maryland Univ., College Park. Lab. for Pattern Analysis.

**RESEARCH RELATIVE TO AUTOMATED MULTISENSOR IMAGE REGISTRATION Final Report**

Laveen N. Kanal Feb. 1983 44 p refs
(Grant NAG5-154)
(NASA-CR-169888; NAS 1.26:169888) Avail: NTIS HC A03/MF A01 CSCL 14B

The basic aproaches to image registration are surveyed. Three image models are presented as models of the subpixel problem. A variety of approaches to the analysis of subpixel analysis are presented using these models. Author

**N83-17855#** Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).

**GYROSCOPIC INSTRUMENTS AND THEIR APPLICATION TO FLIGHT TESTING**

B. Stieler and H. Winter Sep. 1982 216 p refs
(AGARD-AG-160-Vol-15; ISBN-92-835-1433-5) Avail: NTIS HC A10/MF A01

The use of gyroscopic instruments to support flight testing is discussed. Gyroscopic instruments are used in flight tests to measure the aircraft angular accelerations and rates, attitude and heading and - in combination with accelerometers - the linear acceleration, the ground velocity and the position. The measuring principles, the technical layout and the error behavior of the sensors and systems used for these measurements are described. Gyros, accelerometers, attitude and heading references and inertial navigation systems are included. Integrated and hybrid sensor systems as they are used in modern instrumentation systems are considered. Examples of actual flight instrumentation systems are described and the requirements for the gyroscopic sensors in these systems are discussed for applications in aircraft stability and control flight tests, in performance tests and in airborne and ground systems calibration and testing. S.L.

**N83-17856*#** National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

**SELF-CHARGING METERING AND DISPENSING DEVICE FOR FLUIDS Patent Application**

Sonne L. Hooper (Pan American World Airways, Inc., New York) and Drel Setzer, inventors (to NASA) (Pan American World Airways, Inc., New York) Filed 28 Sep. 1982 13 p
(NASA-Case-MSC-20275-1; US-Patent-Appl-SN-425205) Avail: NTIS HC A02/MF A01 CSCL 14B

A predetermined amount of water from the pressurized water source on the shuttle can be measured and dispensed into dehydrated food with minimum effort on the part of the astronaut by using a device comprised of a closed reservoir formed by upper and lower housings which are joined together by retainer rings. The upper housing, containing valve assemblies for attaching the device to the shuttle water supply, has discharge needle. Inside the reservoir, a coil spring co-acts with a piston assembly and the bottom cap of the reservoir. The bottom has a cylindrical guide to maintain alignment of the piston. The spring, whose compressive force of the spring is less than the force exerted by the pressurized water supply, is rather long, providing a relatively constant force over its entire range. The lower housing incorporates a measuring assembly. The astronaut merely sets the amount of fluid desired, moves the valve to fill position, closes the valve, inserts it into the food package, and moves the valve to discharge. NASA

**N83-17857#** Siemens A.G., Munich (West Germany). Technische Abteilung Sensoren.

**MICROELECTRONIC TEMPERATURE SENSOR; SILICON TEMPERATURE SENSOR Final Report, Nov. 1981**

Michael Beitner, Werner Kanert, and Hansjoerg Reichert Bonn Bundesministerium fuerl Forschung und Technologie Sep. 1982 55 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-82-158; ISSN-0340-7608) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 11,50

The development of silicon temperature sensor with a sensitivity and a reliability as high and a tolerance as small as possible for use in measurement and control is discussed. Spreading resistance with the use of silicon doped by neutron transmutation, and trimming of the single wafer tolerances of resistance is obtained; overstress yielded a long term stability better than 0.2%. The advantageous use of this sensor is shown. E.A.K.

**N83-17858#** Battelle Inst., Frankfurt am Main (West Germany). Laser and Optics Dept.

**AN OPTICAL FIBER COUNTER FOR DUST MONITORING AT WORKING PLACES Final Report, Jan. 1982**

Guenter Seger Bonn Bundesministerium fuer Forschung und Technologie Nov. 1982 33 p In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-HA-82-034; BleV-R-640713-2; ISSN-0171-7618) Avail: NTIS HC A03/MF A01; Fachinformationszentrm, Karlsruhe, West Germany DM 7

An instrument which detects and counts fibrous aerosol particles directly in the airborne state was developed. The instrument was tested under controlled conditions in the laboratory and then under various dust conditions at different working places in asbestos working plants in comparison to the conventional filter method. It is confirmed that the concentration of fibrous particles in air can be determined directly at working places by the new instrument. The sensitivity of the instrument is better than that of the conventional technique. E.A.K.

**N83-17859#** Kurt Eichweber Praezisionsgeraetewerk, Hamburg (West Germany).

**DEVELOPMENT OF A MICROPROCESSOR CONTROLLED DIGITAL FUEL GAGING SYSTEM WITH LINEAR CAPACITIVE GAGES Final Report, Apr. 1981**

Rainer Decker, Wolfgang Grossmann, and Wolfgang Bahr Bonn Bundesministerium fuer Forschung und Technologie May 1982 70 p In GERMAN; ENGLISH summary Sponsored by Bundesminisiterium fuer Forschung und Technologie
(BMFT-FB-W-82-001; ISSN-0170-1339) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 14,70

The design of a microprocessor controlled, attitude compensating fuel gauging system based on liquid level sensing by cylindrically shaped, linear capacitive gauges is described. The following details are outlined: (1) the design and the precision of the gauges; (2) results obtained by a computer controlled test setup built to verify the system performance; (3) the software used to simulate the filling of tanks with arbitrary attitudes; and (4) the design and the technical data of the demonstration system. It is shown that the volume of the liquid can be determined with an accuracy of 0.6% for all levels and for a reasonable range of tank attitudes. The physical properties of some typical aircraft fuels show that the density of the fuel can be deduced from its dielectric constant with comparable precision only, if the fuel parameters are known precisely or kept within narrow tolerance limits. E.A.K.

**N83-17860#** Tennessee Univ., Knoxville. Dept. of Nuclear Engineering.

**THERMAL-HYDRAULIC ANALYSIS OF THE DUAL-FUNCTION GAMMA THERMOMETER**

J. O. Johnnson and T. J. Burns Oak Ridge| Tenn. ORNL Dec. 1981 32 p refs
(Contract W-7405-eng-26)
(DE82-007344; ORNL/TM-8089) Avail: NTIS HC A03/MF A01

A computational study was performed to investigate the

potential of a modified gamma thermometer (GT) as a monitor of both the localized power level and the core cooling in a pressurized water reactor. The volumetric heat source within the thermometer was updated to include heat deposited by neutrons as well as heat deposited by decay gammas and neutron-induced gammas. Utilizing this source, along with a more detailed thermal-hydraulics model, a series of thermal-hydraulic calculations were performed to simulate certain reactor transients of interest in order to characterize the gamma thermometer response relative to power level monitoring and adequate core cooling indication. Results reaffirm the feasibility of utilizing the GT as a dual-function (power level and adequate core cooling capacity) measurement device, with each function accomplished virtually independent of the other. The results also indicate that there is a thermal-hydraulic regime for which the GT would no longer give easily interpretable signals. DOE

**N83-17861#** California Univ., Livermore. Lawrence Livermore Lab.
**APPLYING STRUCTURED ANALYSIS IN A REAL-TIME DATA-ACQUISITION ENVIRONMENT**
Nancy A. Storch 5 Nov. 1981 11 p refs Presented at the HP-1000 Intern. Users Group Conf., College Park, Md., 30 Nov. - 2 Dec. 1981
(Contract W-7405-eng-48)
(DE82-006795; UCRL-86341; CONF-811168-1) Avail: NTIS HC A02/MF A01

In order to cut the long term software costs and have a system which more closely meets user's needs, structured analysis and design was applied to a real-time data acquisition environment. The structured aproach has made it easier for people working on independent, but related projects to review designed programs and data bases. Structured analysis and design has become the basis of an internal standard which software team members use to relate their work to the on-going work of others. The structured approach has made possible readable and consistent documentation of the system. DOE

**N83-17862#** Oak Ridge National Lab., Tenn. Physics Div.
**A 0.4 MM INTERFEROMETER SYSTEM USING DIELECTRIC WAVEGUIDE**
D. P. Hutchinson, C. H. Ma, P. A. Staats, and K. L. VanderSluis 1982 10 p refs Presented at the US/Japan Workshop on Sub-Millimeter Diagnostic Tech., Nagoya, Japan, 18 Jan. 1982
(Contract W-7405-eng-26)
(DE82-010197; CONF-820125-1) Avail: NTIS HC A02/MF A01

A 0.4 mm submillimeter wave, phase modulated polarimeter/interferometer is used for simultaneous time dependent measurement of line averaged electron density and poloidal field induced Faraday rotation along chords of the plasma column in ISX-B Tokamak. Heterodyne detection and hollow dielectric waveguides are utilized to achieve the high sensitivity required for the multichord equipment. DOE

**N83-17863#** California Univ., Livermore. Lawrence Livermore Lab.
**LC-4 CAMERA-SYSTEM EVALUATION**
R. P. Reedy 1 Feb. 1981 15 p refs
(Contract W-7405-eng-48)
(DE82-011268; UCID-19299) Avail: NTIS HC A02/MF A01

The LC-4 camera system was evaluated to determine if any advantages can be realized by replacing the 55-mm, f/1.2, CRT Nikkor lens currently in use. Each of the three components of the system (CRT, lens, and film) was evaluated to determine the effect each has on the other. This report includes the data gathered, the conclusions reached, and recommendations for the next generation of CRTs. DOE

**N83-17864#** Wisconsin Univ., Madison. Dept. of Nuclear Engineering.
**THE ECCENTRIC PRESSURIZED TUBE FOR MEASURING CREEP RUPTURE Ph.D. Thesis**
Patrick Richard Schwab 1981 132 p refs
(Contract DE-AS02-78ER-04861)
(DE82-006809; DOE/ER-04861/T3) Avail: NTIS HC A07/MF A01

A method of measuring creep rupture, which involves measuring the curvature of eccentric pressurized tubes is discussed. Theoretical investigations as well as the design, construction, and operation of an experimental apparatus are included. DOE

**N83-17865#** Sandia Labs., Albuquerque, N. Mex.
**FABRICATION OF A 275 DEG C GEOTHERMAL TEMPERATURE TOOL**
Peggy Ann Bonn 1981 4 p ref Presented at the IEEE High Temp. Electron. and Instrumentation Conf., Houston, Tex., 7 Dec. 1981
(Contract DE-AC04-76DP-00789)
(DE82-010078; SAND-82-0267C; CONF-811213-4) Avail: NTIS HC A02/MF A01

The fabrication of a prototype 275 C geothermal temperature tool is reviewed. This tool fabrication uses hybrid circuits. To achieve high temperature operation, the standard military specification hybrid technology was modified in fabrication processes and materials. DOE

**N83-17866#** Brookhaven National Lab., Upton, N. Y.
**FILM ANALYSIS SYSTEMS AND APPLICATIONS**
Y. Yonekura and A. B. Brill 1981 31 p refs Presented at the NATO Advan. Study Inst. on Diagn. Imaging in Med., Castelvecchio, Italy, 11 Oct. 1981
(Contract DE-AC02-76CH-00016)
(DE82-009189; BNL-30887; CONF-8110168-1) Avail: NTIS HC A03/MF A01

The different components that can be used in modern film analysis systems are reviewed. TV camera and charge-coupled device sensors coupled to computers provide low cost systems for applications such as those described. The autoradiography (ARG) method provides an important tool for medical research and is especially useful for the development of new radiopharmaceutical compounds. Biodistribution information is needed for estimation of radiation dose, and for interpretation of the significance of observed patterns. The need for such precise information is heightened when one seeks to elucidate physiological principles/factors in normal and experimental models of disease. The poor spatial resolution achieved with current PET-imaging systems limits the information on radioreceptor mapping, neutrotransmitter, and neuroleptic drug distribution that can be achieved from patient studies. The artful use of ARG in carefully-controlled animal studies will be required to provide the additional information needed to fully understand results obtained with this new important research tool. DOE

**N83-17867#** Sandia Labs., Albuquerque, N. Mex.
**IN-SITU CALIBRATION OF CAPACITANCE MONOMETERS**
Johnny L. Hartley and Ernest C. Fuentes 1982 4 p refs Presented at the Meas. Sci. Conf., San Diego, Calif., 21 Jan. 1982
(Contract DE-AC04-76DP-00789)
(DE82-010084; SAND-81-2653C; CONF-820111-2) Avail: NTIS HC A02/MF A01

Volumetric pressure division is a process of providing calculated test pressures beginning with an initial small volume of gas at high pressure and expanding into other known volumes. An in situ calibration using volumetric pressure division is described. Calibration performance is evaluated by using established manometer dial corrections in calculating the gas leak rate of a known leak rate standard. A difference of 0.7% is shown between the standard's mass spectrometer gas leak calibration and a gas leak measurement using the manometer dial corrections. DOE

**N83-17868#** Oak Ridge National Lab., Tenn.
**RESPONSE OF NEUTRON DOSIMETERS TO DIFFERENT NEUTRON FIELDS**
Dieter Sgraja 1981 29 p refs Transl. into ENGLISH of Report SAAS-281
(Contract W-7405-eng-26)

(DE82-011837; ORNL-tr-4815; SAAS-281) Avail: NTIS HC A03/MF A01

Correction factors were calculated for the reading of two different fission-fragment dosimeters (with (237) Np and (232) Th/U radiators, respectively) in neutron fields of various unshielded and shielded sources. Shielding materials considered were water, polyethylene, concrete, and iron; thicknesses varied up to 180 cm. For three primary neutron spectra shielding factor-versus-thickness plot are given as an aid to roughly assessing the exposure situation at neutron working places. DOE

**N83-17869#** Oak Ridge National Lab., Tenn.
**LIFETIME IMPROVEMENT OF SHEATHED THERMOCOUPLES FOR USE IN HIGH-TEMPERATURE AND THERMAL OPERATIONS**
R. W. McCulloch and J. H. Clift (Oak Ridge Y-12 Plant) 1982 34 p refs Presented at the 6th Symp. on Temp., Washington, 14 Mar. 1982
(Contract W-7405-eng-26)
(DE82-008844; CONF-820306-4) Avail: NTIS HC A03/MF A01

Premature failure of small-diameter, magnesium-oxide-insulated sheathed thermocouples occurred when they were placed within nuclear fuel rod simulators to measure high temperatures and to follow severe thermal transients encountered during simulation of nuclear accidents in Oak Ridge National Laboratory thermal-hydraulic test facilities. Investigation of thermally cycled thermocouples yielded three criteria for improvement of thermocouple lifetime: (1) reduction of oxygen impurities prior to and during their fabrication; (2) refinement of thermoelement grain size during their fabrication; and (3) elimination of prestrain prior to use above their recrystallization temperature. The first and third criteria were satisfied by improved techniques of thermocouple assembly and by a recovery anneal prior to thermocouple use. DOE

**N83-17870#** California Univ., Livermore. Lawrence Livermore Lab.
**RESPONSE TESTS OF A SPUTTERED GAGE PRESSURE TRANSDUCER**
E. W. McCauley, W. M. Shay, Jr., W. S. Filler, and P. M. Aronson Sep. 1982 62 p refs
(Contract W-7405-eng-48)
(DE83-001541; UCID-19466) Avail: NTIS HC A04/MF A01

Dynamic response characteristics of the CEC 1000 sputtered gage pressure transducer was investigated. These transducers feature a narrow diameter, integral, reentrant tube in front of the gaged diaphram. A conventional shock tube was used under conditions of an initial static He gas pressure of 20 psi and applied a step pressure of about psi. Two resonant frequencies, at about 1.8 kHz and 11 kHz, were observed. A shockless pressure step generator was also used with both He gas filling and water filling of the transducer's reentrant tube. Initial static pressure was 10 psi. Step pressures of 30, 60, and 90 psi were applied. Under gas filled conditions, the resonant frequencies were found to be about 1.4 kHz and 11 kHz. Under water filled conditions, the low resonance decreased to a range of about 0.7 to 1.1 kHz. Damping essentially eliminated the high frequency resonance. DOE

**N83-17762#** Joint Publications Research Service, Arlington, Va.
**PHILIPS OPTICAL STORAGE DISCS DESCRIBED**
*In its* West Europe Rept.: Sci. and Technol., No. 134 (JPRS-82686) 20 Jan. 1983 p 8-13 Transl. into ENGLISH from Die Computer Zeitung (West Germany), 8 Sep. 1982 p 5, 6, 8 (For primary document see N83-17761 08-31)
Avail: NTIS HC A05/MF A01

## 36 LASERS AND MASERS

Includes parametric amplifiers.

**N83-17871*#** Old Dominion Univ., Norfolk, Va. Dept. of Physics.
**THEORETICAL STUDIES OF SOLAR-PUMPED LASERS Progress Report, 16 Jul. 1982 - 15 Jan. 1983**
Wynford L. Harries Jan. 1983 37 p refs
(Grant NsG-1568)
(NASA-CR-169890; NAS 1.26:169890) Avail: NTIS HC A03/MF A01 CSCL 20E

Possible types of lasers were surveyed for solar power conversion. The types considered were (1) liquid dye lasers, (2) vapor dye lasers, and (3) nondissociative molecular lasers. These are discussed. S.L.

**N83-17872#** Hughes Aircraft Co., El Segundo, Calif.
**OPTICAL RESONANCE TRANSFER LASER (ORTL) DEVELOPMENT Final Technical Report, 27 May 1980 - 27 May 1982**
P. K. Baily, J. H. Wang, J. Finzi, R. C. Smith, and J. Paranto Jul. 1982 129 p
(Contract N00173-80-C-0132; DARPA Order 3932)
(AD-A121256; HAC-FR82-72-814; HAC-REF-E5542) Avail: NTIS HC A07/MF A01 CSCL 20/5

This report describes an experimental program aimed at assessing the feasibility of using an intracavity ORTL system for HF laser mode control. The initial experiments utilized existing extracavity ORTL hardware to continue the investigation of ORTL kinetics. The most significant result of these initial experiments was the identification of SF6 as an alternative diluent to helium. The major part of the program was devoted to the fabrication and use of new intracavity ORTL hardware. Temporally stable spectrally controlled intracavity ORTL operation was demonstrated for the first time. The combined use of spectral control coatings in the chemical laser resonator and inlet temperature control of the ORTL medium resulted in ORTL outputs up to 152 watts and overall efficiencies of HF chemical laser radiation to HF ORTL output up to 38%. Detailed measurements of energy deposition in mirrors and in the ORTL medium, of temperature profiles, and of small signal gain utilizing helium and SF6 as ORTL diluents were made over a wide range of operational ORTL parameters. The simultaneous development of an intracavity ORTL model, including an HF chemical laser simulation, allowed comparison of theory and experiment. This resulted in the achievement of a good understanding of the physical processes which are important for efficient intracavity ORTL operation. The model code can now be used for the design of larger systems. Efficiencies of 85 to 90% should be attainable in large systems. Author (GRA)

**N83-17873#** Naval Research Lab., Washington, D. C. Laser Plasma Branch.
**NUMERICAL STUDY OF PHASE CONJUGATION IN STIMULATED BACKSCATTER WITH PUMP DEPLETION**
R. H. Lehmberg 17 Sep. 1982 13 p refs Sponsored in part by DOE
(AD-A121267; AD-E000503; NRL-MR-4890) Avail: NTIS HC A02/MF A01 CSCL 20/5

Two dimensional numerical simulations are presented of phase conjugation in stimulated backscatter of a focused abberrated beam, including the effects of pump depletion. In all cases, pump depletion significantly improved the conjugation fidelity H. As expected, the far field distribution of light scattered back through the aberrator exhibited a prominent axial spike closely matching that of the incident beam; however, the near field distribution had large and rapid spatial inhomogeneities, even for H approximately 90%. In spite of such structure, the backscatter was able to reproduce a rough image of large scale modulation in the incident beam. GRA

**N83-17874#** Naval Research Lab., Washington, D. C. Optical Sciences Div.
**INTENSITY NOISE AND SPECTRAL PROPERTIES OF LOW NOISE GaAlAs LASERS Interim Report**
A. Dandridge, L. Goldberg, and R. O. Miles 29 Sep. 1982 16 p refs
(AD-A121269; AD-E000502; NRL-MR-4908) Avail: NTIS HC A02/MF A01 CSCL 20/5

We present measurements of the output properties of two types of new low noise noncommercially available Hitachi diode

lasers. Measurements of the intensity and phase noise of lasers running with or without optical feedback are described. GRA

**N83-17875#** Los Alamos Scientific Lab., N. Mex.
**THE rf MODULATOR DESIGN AND PHASE AMPLITUDE CONTROL FOR A HIGH-POWER FREE-ELECTRON-LASER LINAC**
R. F. Hoeberling and P. J. Tallerico 1981 4 p refs Presented at the Linear Accelerator Conf., Santa Fe, N. Mex., 19-21 Oct. 1981 Sponsored in part by AFOSR, DARPA and Naval Air Systems Command
(Contract W-7405-eng-36)
(DE82-006129; LA-UR-81-3072; CONF-811083-18) Avail: NTIS HC A02/MF A01

The building of tunable lasers using an electron accelerator as the source of primary energy which resulted in the design of a new accelerator is discussed. It is demonstrated that this design does work in an amplifier mode. The accelerator is to be upgraded for use in an oscillator experiment and the new RF power amplifier system must meet some of the very stringent demands for power and stability placed on the electron beam for the free-electron laser (FEL) interaction. The electron beam energy ultimately will circulate back through the accelerator so that the electron beam energy not used in the FEL interaction is not wasted. The design of the second FEL system are considered. DOE

**N83-17876#** Oak Ridge National Lab., Tenn. Product Certification Div.
**VAPORIZATION OF SEDIMENTS WITH A PULSED TRANSVERSE EXCITATION AT ATMOSPHERIC PRESSURE (TEA) CO2 LASER SYSTEM**
N. R. Smyrl and H. G. King, Jr. 31 Dec. 1981 21 p refs
(Contract W-7405-eng-26)
(DE82-005669; Y/DK-285) Avail: NTIS HC A02/MF A01

A transverse excitation at atmospheric pressure (TEA) pulsed CO2 laser equipped with an adjunct called a Lasertrace was used to generate vapor and/or particulates from sediment samples. The material thus obtained can be transferred to analytical systems for analysis making possible the analysis of solids by techniques previously suitable only for liquids or gases. Approximately one milligram of vapor and/or particulates was obtained in a short period of time by this method, suitable for transport to other systems. DOE

**N83-17877#** California Univ., Livermore. Lawrence Livermore Lab.
**PULSED-LASER TECHNIQUES FOR TRANSIENT MEASUREMENTS AT SEMICONDUCTOR PHOTOELECTROCHEMICAL SOLAR CELLS**
J. H. Richardson, S. P. Perone, S. B. Monaco, L. L. Steinmetz, and J. E. Harrar Jan. 1982 17 p refs Presented at the Measurement Tech. for Photoelectrochem. Solar Cells Symp. and the Photoelectrochem. Process. Symp., 160th Electrochem. Soc. Meeting, Denver, 12-16 Oct. 1981
(DE82-005182; UCRL-85823-Rev-1; CONF-811013-14-Rev-1) Avail: NTIS HC A02/MF A01

Pulsed laser excitation sources provide a convenient means of initiating and probing photophysical and photochemical processes at the semiconductor electrode-electrolyte interface. Both time-resolved optical and electrochemical measurements are used to characterize the dynamics of intra-electrode charge separation and interfacial charge transfer as a function of applied bias, solution composition, and electrode physical properties. The philosophy behind this approach to transient measurements is illustrated with experimental results involving single crystal and polycrystalline electrodes. DOE

**N83-17878#** California Univ., Livermore. Lawrence Livermore Lab.
**ARGUS LASER PLASMA EXPERIMENTS AT 1.06 MUON M, 0.5 MUON M AND 0.35 MUON M**
R. E. Turner, E. M. Campbell, W. C. Mead, F. Ze, C. Max, D. W. Phillion, P. Lee, B. Pruett, G. Tirsell, and B. F. Lasinski 1982 25 p refs Presented at the 15th European Conf. on Laser Interaction with Matter, Garching, West Germany, 18-22 Jan. 1982 Submitted for publication
(Contract W-7405-eng-48)
(DE82-006859; UCRL-86911; CONF-820119-2) Avail: NTIS HC A02/MF A01

The ARGUS wavelength scaling experiments were performed on low (Be) and high (Au) Z disk targets, with laser wavelengths of 1.06 micro m, 0.53 micro m and 0.35 micron m. Box calorimeter measurements show increasing fractional absorption at shorter laser wavelengths; absolutely calibrated hard X-ray detectors show the number of suprathermal electrons to be greatly decreased. Scattered light measurements concentrated on stimulated Raman scattering, and the 3/2 harmonic. The SRS was spectrally and temporally resolved during 0.53 micro m irradiations; it is shown the scattering to be principally from the convective instability, near tenth critical density. Near omega/2, a double peaked spectral feature is observed. DOE

**N83-17879#** Los Alamos Scientific Lab., N. Mex.
**PULSE PROPAGATION IN TAPERED WIGGLER FREE ELECTRON LASERS**
John C. Goldstein and William B. Colson 1981 18 p refs Presented at the Intern. Conf. on Lasers, New Orleans, 14-18 Dec. 1981
(Contract W-7405-eng-36)
(DE82-010434; LA-UR-82-186; CONF-811229-1) Avail: NTIS HC A02/MF A01

The one-dimensional theory of short pulse propagation in free electron lasers is extended to tapered wiggler devices and is used to study the behavior of an oscillator with parameter values close to those expected in forthcoming experiments. It is found that stable laser output is possible only over a small range of optical cavity lengths. Optical pulse characteristics are presented and are found to change considerably over this range. DOE

# 37 MECHANICAL ENGINEERING

Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

**N83-17880*#** General Electric Co., Cincinnati, Ohio. Aircraft Engine Business Group.
**BEARING FATIGUE INVESTIGATION 3 Final Report**
A. H. Nahm, E. N. Bamberger, and H. Signer (Industrial Tectonics, Inc., Compton, Calif.) May 1982 83 p refs
(Contract NAS3-15337)
(NASA-CR-168029; NAS 1.26:168029; GE-R82AEB304) Avail: NTIS HC A05/MF A01 CSCL 13I

The operating characteristics of large diameter rolling-element bearings in the ultra high speed regimes expected in advanced turbine engines for high performance aircraft were investigated. A high temperature lubricant, DuPont Krytox 143 AC, was evaluated at bearing speeds to 3 million DN. Compared to the results of earlier, similar tests using a MIL-L-23699 (Type II) lubricant, bearings lubricated with the high density Krytox fluid showed significantly higher power requirements. Additionally, short bearing lives were observed when this fluid was used with AISI M50 bearings in an air atmosphere. The primary mode of failure was corrosion initiated surface distress (fatigue) on the raceways. The potential of a case-carburized bearing to sustain a combination of high-tangential and hertzian stresses without experiencing race fracture was also investigated. Limited full scale bearing tests of a 120 mm bore ball bearing at a speed of 25,000 rpm (3 million DN) indicated that a carburized material could sustain spalling fatigue without subsequent propagation to fracture. Planned life tests of the carburized material had to be aborted, however, because of apparent processing-induced material defects. J.M.S.

**N83-17881*#** Rocketdyne, Canoga Park, Calif.
**DYNAMIC BALANCE IMPROVEMENT PROGRAM Final Report**
M. F. Butner [1983] 315 p refs

(Contract NAS8-34423)
(NASA-CR-170711; NAS 1.26:170711; RI/RD82-285) Avail: NTIS HC A14/MF A01 CSCL 13K

The reduction of residual unbalance in the space shuttle main engine (SSME) high pressure turbopump rotors was addressed. Elastic rotor response to unbalance and balancing requirements, multiplane and in housing balancing, and balance related rotor design considerations were assessed. Recommendations are made for near term improvement of the SSME balancing and for future study and development efforts. E.A.K.

**N83-17882*#** National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
**X-RAY DETERMINATION OF PARTS ALIGNMENT Patent Application**
Charles W. Nelson, inventor (to NASA) (Beech Aircraft Corp., Wichita, Kans.) Filed 2 Nov. 1982 11 p Sponsored by NASA (NASA-Case-MSC-20418-1; US-Patent-Appl-SN-438446) Avail: NTIS HC A02/MF A01 CSCL 22B

A method for determining the alignment of adjoining metal objects is provided. The method comprises producing an X-ray image of adjoining surfaces of the two metal objects. The X-ray beam is tangential to the point the surfaces are joined. The method is particularly applicable where the alignment of the two metal objects is not readily susceptible to visual inspection. NASA

**N83-17883*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
**MULTIPLE PLATE HYDROSTATIC VISCOUS DAMPER Patent Application**
L. P. Ludwig, inventor (to NASA) Filed 10 Jan. 1983 9 p
(NASA-Case-LEW-13445-2; US-Patent-Appl-SN-456929) Avail: NTIS HC A02/MF A01 CSCL 13I

The damping radial motion of a rotating shaft is addressed. The damper comprises a series of spaced plates extending in a radial direction. A hydraulic piston is utilized to place a load in these plates. Each annular plate is provided with a suitable hydrostatic bearing geometry on at least one of its faces. This structure provides a high degree of dampening in a rotor case system of turbomachinery in general. The damper is particularly useful in gas turbine engines. NASA

**N83-17884#** Stuttgart Univ. (West Germany). Inst. fuer Statik und Dynamik.
**COMPUTATIONAL ASPECTS OF WELDING STRESS ANALYSIS**
J. H. Argyris, J. Szimmat, and K. J. William Dec. 1981 55 p refs
(ISD-287; ISSN-0170-6071) Avail: NTIS HC A04/MF A01

The residual stresses and deformations due to arc-welding are determined in a rectangular steel plate. The thermomechanical response behavior is computed in two steps, (1) the heat flow analysis of the entire plate due to the moving electrode, and (2) the thermoelastic-viscoplastic response analysis of the midsection for the transient temperature history at this section. The staggered solution strategy leads to a fully integrated approach of the thermal and mechanical solution steps within each time increment providing for weak thermomechanical coupling. The main difficulties arise due to the transient character of the heating-cooling cycle which spans the entire temperature regime from room temperature up to melting and vice versa. The incremental solution of the thermoelastic-viscoplastic process is illustrated with the arc-welding of a rectangular steel plate for which limited experimental data are also available. Author

**N83-17885#** Maschinenfabrik Augsburg-Nuernberg A.G., Augsburg (West Germany).
**REDUCTION OF NOISE EMITTED BY MEDIUM-SPEED DIESEL ENGINES BY PARTIEL ENCASING Final Report, Mar. 1981**
Guenter Donath and Meinrad Fackler Bonn Bundesministerium fuer Forschung und Technologie Sep. 1982 56 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-HA-82-018; ISSN-0171-7618) Avail: NTIS HC A04/MF A01; Fachinformations-zentrum, Karlsruhe, West Germany DM 12

Reduction of the overall noise level at medium speed diesel engines by covering a large part of the surface with engine borne cladding was investigated. The experimental encapsulation reduced the noise level by 11,5 dB(A), though with almost complete cladding of the surface. It was showed that the restriction of the cladding to the louder upper parts, was not very beneficial. Improvements proposed for design details of the low maintenance sliding doors concept. E.A.K.

**N83-17886#** Alberta Univ., Edmonton.
**RATIONALE FOR ADVANCES IN THE TECHNOLOGY OF I.C. ENGINES**
J. D. Dale and A. K. Oppenheim (California Univ., Lawrence Berkeley Lab., Berkeley) Aug. 1981 48 p refs Presented at the Soc. of Auto. Engr. Intern. Congr. and Expo., Detroit, 22-26 Feb. 1982
(Contract W-7405-eng-48)
(DE82-000264; LBL-13179; CONF-820203-1) Avail: NTIS HC A03/MF A01

The advantages of the new constraints of I.C. engines, pollution control and fuel economy requirements, by further advances in engine technology, designed to minimize pollutant emissions, maximize engine efficiency, and optimize tolerance to a wider variety of fuels are discussed. The fundamental advantages of reciprocating I.C. engines as prime movers for automobiles are assessed. Controlled combustion is based upon a proper treatment of active radicals, the essential elements of the combustion reaction. This can be achieved by a variety of means, such as charge stratification, exhaust gas recirculation, homogeneous lean burn, combined with enhanced ignition and enhanced autocatalysis. It is concluded that the most desirable advances in engine technology would transfer a good deal of the functions served by catalytic converters and electronic controls into the chemistry and mechanics of combustion processes taking place in the engine cylinder. DOE

**N83-17887#** Du Pont de Nemours (E. I.) and Co., Aiken, S.C.
**PREDICTION OF CENTRIFUGAL PUMP-CLEANING ABILITY IN WASTE SLUDGE**
Bernice V. Churnetski 1981 17 p refs Presented at the Am. Nucl. Soc. Winter Meeting, San Francisco, 29 Nov. - 4 Dec. 1981
(Contract DE-AC09-76SR-00001)
(DE82-010689; DP-MS-81-68; CONF-811103-117) Avail: NTIS HC A02/MF A01

Radioactive waste is being transferred from older waste tanks to stress relieved tanks for more effectie waste management. The technology developed for waste removal involves the use of long shaft, recirculating, centrifugal pumps (slurry pumps). Testing completed at the 30 meter diameter mock up waste tank related the effective cleaning radius of a slurry pump to critical pump and materials characteristics. The technology can be applied to other remote handing situations where the slurry rheology can be determined. DOE

**N83-17888#** Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.
**AN INVESTIGATION OF FACTORS CONTROLLING GTA WELD-BEAD GEOMETRY**
H. B. Smartt and J. F. Key 1981 37 p refs Presented at the Conf. on Trends in Welding Res. in the US, New Orleans, 16-18 Nov. 1981 Submitted for publication
(Contract DE-AC07-76ID-01570)
(DE82-011530; EEG-M-10581; CONF-811184-1) Avail: NTIS HC A03/MF A01

In welding processes employing a consumable electrode, the input of heat and mass to the fusion zone is coupled. In contrast, in the gas tungsten arc welding (GTAW) process, which uses a nonconsumable tungsten electrode, the input of heat and mass to the fusion zone are not coupled. As a result, the relationships between process parameters (current, arc voltage, welding speed,

and filler wire speed) and weld bead geometry (bead width, penetration, and reinforcement) for GTA welding are complex. This work presents an experimental study of the process-parameter/weld-bead-geometry relationships for constant parameter GTAW of Type 304 stainless steel. Bead-on-plate results for partial-penetration welds in 12.5 mm thick plate, using an automatic GTAW machine, are presented. DOE

**N83-17889#** Alberta Univ., Edmonton.
**A RATIONALE FOR ADVANCES IN THE TECHNOLOGY OF I. C. ENGINES**
J. D. Dale and A. K. Oppenheim (California Univ., Berkeley, Lawrence Berkeley Lab.) Nov. 1981 51 p refs Presented at the 1982 SAE Intern. Congr. and Exposition, Detroit, 22-26 Feb. 1982
(Contract W-7405-eng-48)
(DE82-005840; LBL-13179-Rev; CONF-820203-2) Avail: NTIS HC A04/MF A01

Internal combustion (I.C.) engines are required to meet demands for improved air pollution control and greater fuel economy. These demands were met by peripheral engine system improvements such as catalytic converters and electronic controls. It is proposed that the most desirable advances in engine technology transfer the functions of catalytic converters and electronic controls into the chemistry and mechanics of combustion processes taking place within the engine cylinders, and that advances in controlled combustion technology results in minimum pollutant emissions, maximum engine efficiency, and optimum tolerance for a wider variety of engine fuels. DOE

**N83-17890#** Borg-Warner Corp., Carson, Calif.
**MAIN-COOLANT-PUMP SHAFT-SEAL RELIABILITY INVESTIGATION Interim Report**
C. E. Fair, J. A. Marsi, and A. O. Greer Sep. 1982 55 p Sponsored by Electric Power Research Inst.
(EPRI Proj. 1556-1)
(DE83-900266; EPRI-NP-2611-Vol-1) Avail: NTIS HC A04/MF A01

Reactor coolant pump shaft seal reliability was surveyed. The sample is representatively large and includes the three industry seal suppliers. Operationally incurred/induced problems and seal redesign parameters are identified. Failure hypotheses in the form of fault trees are developed to describe the failure mechanisms. Recommendations are made for seal reliability improvement. DOE

**N83-17891#** Sandia Labs., Albuquerque, N. Mex. Experimental Mechanics Div.
**VOLTAGE DROP AND TEMPERATURE MEASUREMENTS DURING TUBE CLOSURE BY RESISTANCE WELDING**
T. R. Bieler, J. R. Spingarn, and W. E. Jorgenson Jul. 1982 22 p ref
(Contract DE-AC04-76DP-00789)
(DE83-000298; SAND-82-8024) Avail: NTIS HC A02/MF A01

Techniques to actively monitor the pinch welding processes, a form of resistance welding used to seal pressurized tubes, were developed. The studies were designed to support a computer modeling effort by providing boundary conditions for the analysis and by measuring verification parameters for comparison with computer predictions. In particular, temperature histories at several places in and around the weld were measured. The voltage drops and currents across the weld from which the dynamic resistance can be calculated were also obtained. The techniques described here are useful for monitoring welding machine output, detecting metallurgical changes, developing accept/reject criteria, and even improving control of the resistance welding process. DOE

# 38 QUALITY ASSURANCE AND RELIABILITY

Includes product sampling procedures and techniques; and quality control.

**N83-17892*#** George Washington Univ., Washington, D.C. Inst. for Management Science and Engineering.
**RELIABILITY CALCULATION USING RANDOMIZATION FOR MARKOVIAN FAULT-TOLERANT COMPUTING SYSTEMS**
Douglas R. Miller 29 Oct. 1982 42 p refs
(Grant NAG1-179)
(NASA-CR-169864; NAS 1.26:169864) Avail: NTIS HC A03/MF A01 CSCL 14B

The randomization technique for computing transient probabilities of Markov processes is presented. The technique is applied to a Markov process model of a simplified fault tolerant computer system for illustrative purposes. It is applicable to much larger and more complex models. Transient state probabilities are computed, from which reliabilities are derived. An accelerated version of the randomization algorithm is developed which exploits "stiffness' of the models to gain increased efficiency. A great advantage of the randomization approach is that it easily allows probabilities and reliabilities to be computed to any predetermined accuracy. S.L.

**N83-17893*#** City Univ., London (England). Dept. of Mathematics.
**A BAYESIAN MODIFICATION TO THE JELINSKI-MORANDA SOFTWARE RELIABILITY GROWTH MODEL**
Bev Littlewood and Ariela Sofer [1983] 59 p refs Prepared in cooperation with George Washington Univ., Washington, D.C.
(Grants NAG1-179; DAAG29-80-G-0067; DA-ERO-79-G-0038)
(NASA-CR-169743; NAS 1.26:169743) Avail: NTIS HC A04/MF A01 CSCL 14D

The Jelinski-Moranda (JM) model for software reliability was examined. It is suggested that a major reason for the poor results given by this model is the poor performance of the maximum likelihood method (ML) of parameter estimation. A reparameterization and Bayesian analysis, involving a slight modelling change, are proposed. It is shown that this new Bayesian-Jelinski-Moranda model (BJM) is mathematically quite tractable, and several metrics of interest to practitioners are obtained. The BJM and JM models are compared by using several sets of real software failure data collected and in all cases the BJM model gives superior reliability predictions. A change in the assumption which underlay both models to present the debugging process more accurately is discussed. E.A.K.

**N83-17894#** Brookhaven National Lab., Upton, N. Y.
**MODELING OF MULTIPLE SEQUENTIAL FAILURES DURING TESTING, MAINTENANCE AND CALIBRATION**
P. K. Samanta and S. P. Mitra Dec. 1981 77 p refs
(Contract DE-AC02-76CH-00016)
(DE82-008454; NUREG/CR-2211; BNL-NUREG-51411) Avail: NTIS HC A05/MF A01

The nature of dependence among human failures in a multiple sequential action was analyzed and distinguished from other types of multiple failures. Human error causes selective failure of components depending on when the failure started. Two models are developed for quantifying the failure probability in a multiple sequential action. The first is very general in nature and does not require any dependent failure data. The failure probability is a conservative uncertain. The uncertainty is calculated by considering many possible sources: data, coupling and modeling. In the second model details of the process in multiple sequential failures are considered. The model increments the conditional failure probabilites by a certain amount from their lower bounds. The approach provides insights into the influence of dependence between failures on system reliability. DOE

# 39 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; and thermal stress.

For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance.*

**N83-17895#** Shock and Vibration Information Center (Defense), Washington, D. C.
**THE SHOCK AND VIBRATION DIGEST, VOLUME 14, NO. 11 Monthly Report**
Judith Nagle-Eshleman, ed. Nov. 1982 88 p refs
(AD-A122062) Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

The Shock and Vibration Digest is a monthly publication of the Shock and Vibration Information Center. The goal of the Digest is to provide efficient transfer of sound, shock, and vibration technology among researchers and practicing engineers. Subjective and objective analyses of the literature are provided along with news and editorial material. For individual titles, see N83-17896 through N83-17897.

**N83-17896#** Illinois Univ., Chicago. Dept. of Civil Engineering, Mechanics and Metallurgy.
**SPALL FRACTURE OF SOLIDS**
D. Krajcinovic *In* Shock and Vibration Information Center The Shock and Vibration Inform. Digest, Vol. 14. No. 11 Nov. 1982 p 13-17 refs Sponsored by NSF (For primary document see N83-17895 08-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

Spalling in solid materials was investigated and general features of material fracture and crack propagation are summarized. Analytical methods are reviewed and passive and active models are described and compared. E.A.K.

**N83-17897#** Virginia Univ., Charlottesville. Dept. of Mechanical and Aerospace Engineering.
**OPTIMAL VIBRATION REDUCTION OVER A FREQUENCY RANGE**
W. D. Pilkey, L. Kitis, and B. P. Wang *In* Shock and Vibration Information Center The Shock and Vibration Inform. Digest, Vol. 14, No. 11 Nov. 1982 p 19-27 refs Sponsored by ONR (For primary document see N83-17895 08-39)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

Optimal vibration reduction techniques for systems subject to harmonic excitation over a frequency range are reviewed. Only passive means of control are considered. The objective functions used for optimization are restricted to those that relate directly to some measure of frequency response. E.A.K.

**N83-17898** Prins Maurits Lab. TNO, Rijswijk (Netherlands). Inst. for Chemical and Technological Research.
**TOODY SIMULATIONS OF THE CYLINDER EXPANSION TEST**
R. R. Ijsselstein Mar. 1981 20 p refs
(PML-1981-19; TDCK-75337) Copyright. Avail: Issuing Activity

The cylinder expansion test for the determination of the metal acceleration capability of high explosives was simulated with hydrocodes. Results of the high explosive Composition B, Grade A simulation with the aid of the code TOODY IV are presented. Computations were carried out with two grids differing in resolution. The expansion and expansion velocity of the accelerated cylinder wall, the pressure along the cylinder axis, and the energy dissipation in the cylinder wall during its acceleration are reported. The detonation process can be described with the finer of the two grids. A description of the shock reverberations and the dissipation in the cylinder wall requires a much finer grid. It is concluded that with the presented set up, TOODY is well suited to accurately reproduce the measured expansion history. E.A.K.

**N83-17899*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
**STRUCTURAL TESTING FOR STATIC FAILURE, FLUTTER AND OTHER SCARY THINGS**
Rodney H. Ricketts Jan. 1983 43 p refs Presented at the Ann. Conv. of Exptl. Aircraft Assoc., Oshkosh, Wis., Aug. 1982
(NASA-TM-84606; NAS 1.15:84606) Avail: NTIS HC A03/MF A01 CSCL 20L

Ground test and flight test methods are described that may be used to highlight potential structural problems that occur on aircraft. Primary interest is focused on light-weight general aviation airplanes. The structural problems described include static strength failure, aileron reversal, static divergence, and flutter. An example of each of the problems is discussed to illustrate how the data acquired during the tests may be used to predict the occurrence of the structural problem. While some rules of thumb for the prediction of structural problems are given the report is not intended to be used explicitly as a structural analysis handbook. Author

**N83-17900*#** Old Dominion Univ., Norfolk, Va. Dept. of Mechanical Engineering and Mechanics.
**PROGRESS IN THERMOSTRUCTURAL ANALYSIS OF SPACE STRUCTURES**
Earl A. Thornton, Pramote Dechaumphai, Jack Mahaney, and Ajay K. Pandey 1982 17 p refs Presented at the NASA Conf. on Large Space Antenna Systems Technol., Hampton, Va., 30 Nov. - 3 Dec. 1982 Sponsored by NASA. Langley Research Center, and AFFDL
(NASA-CR-169886; NAS 1.26:169886) Avail: NTIS HC A02/MF A01 CSCL 20K

A finite element space structures research focused on the interdisciplinary problems of heating, thermal, and structural analysis is discussed. Slender member shadowing effects, and cable stiffened structures are described. S.L.

**N83-17901#** Aeronautical Research Inst. of Sweden, Stockholm. Structures Dept.
**FATIGUE EVALUATION OF WTS-3 GLASS FIBER BLADE MATERIAL**
Anders F. Blom Aug. 1982 27 p refs
(Contracts NE-5061-014; NE-5061-15)
(FFA-TN-1982-26) Avail: NTIS HC A03/MF A01

The fatigue properties of the WTS-3 wind turbine blade material were assessed. Flat test specimens of filament wound material were used for the fatigue tests. Wohler diagrams (SN curves) were produced both at purely tensile loading R = delta min/max = 0 and at completely reversed loading R = 1. It is shown that compressive loads are detrimental, due to local fiberbuckling which results in a substantial lowering of the entire SN curve. E.A.K.

**N83-17902#** National Aerospace Lab., Amsterdam (Netherlands). Structures and Materials Div.
**FATIGUE THRESHOLD AND SHORT CRACK SIGNIFICANCE FOR AIRCRAFT**
R. J. H. Wanhill 6 Jan. 1982 7 p refs Presented at 8th Australasian Conf. on the Mech. of Struct. and Mater., 23-26 Aug. 1982
(NLR-MP-82007-U) Avail: NTIS HC A02/MF A01

The significance of fatigue thresholds and short cracks for aircraft structures with respect to the design and operating requirements of safety, durability and inspectability is considered. E.A.K.

**N83-17903#** National Aerospace Lab., Amsterdam (Netherlands). Structures and Materials Div.
**CREEP AND FATIGUE INTERACTIONS IN A NICKEL BASE SUPERALLOY**
H. J. Kolkman and R. J. H. Wanhill Jan. 1982 8 p Presented at 6th Intern. Conf. on Strength of Metals and Alloys, Melbourne, Aug. 1982 Sponsored by Royal Netherlands Air Force Scientific Research Div., Directorate of Materiel
(NLR-MP-82003-U) Avail: NTIS HC A02/MF A01

The influences of prior creep on fatigue life and of prior fatigue

on creep life for Rene 80 nickel base superalloy bars were investigated. Aircraft gas turbine components are subjected to combinations of creep and fatigue. For any particular service problem it is important to recognize the relative contributions of creep and fatigue. The influences are profound and sometimes highly beneficial and have important practical implications. Most of the results are explained from microstructural investigation by transmission electron microscopy. Fracture surface examination does not show reliable differences between specimens subjected to fatigue and prior creep and fatigue. It is concluded that the used fractography as a diagnostic tool for service failure analysis is limited in the case of creep and fatigue interactions. E.A.K.

**N83-17904#** Technical Research Centre of Finland, Espoo. Metals Lab.

**A STRESS FIELD PARAMETER FOR WELD HYDROGEN CRACKING Ph.D. Thesis - Helsinki Univ. of Technol., Espoo**

Risto A. J. Karppi May 1982 121 p refs Sponsored by Japanese Ministry of Education, Science and Culture, Osaka Univ., Kawasaki Heavy Industries Ltd., Nippon Kokan K. K., Academy of Finland, Oy ESAB, Oy Ovako AB, Oxeloesunds Jaernverk, Rautaruukki Oy and Finnish Cultural Foundation

(VTT-9; ISBN-951-38-1536-6; ISSN-0358-5069) Avail: NTIS HC A06/MF A01

Hydrogen induced cracking in the heat affected zone of steel weldments was studied with special reference to mechanical aspects. The stress field in the vicinity of the root of the root run butt weld and the notch of the implant specimen was examined. A parameter sigma sub I analogical to the stress intensity factor, is defined and proposed as a stress controlling factor for weld hydrogen cracking. The effects of various geometric factors on sigma sub I are analyzed by defining a specimen severity parameter F sub I and determining its values by finite element analysis. An approximate method is established for determining the value of the F sub I parameter for real joints of three groove geometries: single bevel, double Vee and oblique y groove. The F sub I parameter is applied to correlate various implant test and restraint test results. Two further parameters were employed: (1) remaining diffusible hydrogen content of weld metal at 100 C, H(R100), and (2) HAZ hardness (HV 1). These were used to eliminate the difference between the tests in hydrogen level and microstructure respectively. The results show the high potentiality of the three parameters: sigma sub I, H(R100) and HV 1. Further, the results do strongly imply that the implant test results can be applied to real structures in assessing the hydrogen cracking risk. The deep notch implant speciment was found to have many advantages over the shallow and helical notch specimens in this respect. M.G.

**N83-17905#** Stuttgart Univ. (West Germany). Inst. fuer Statik und Dynamik.

**ARLIS 1.0: LINEAR INVESTIGATION OF AEROELASTIC SYSTEMS IN ROTATION [ARLIS 1.0: AEROELASTICHE ANALYSE ROTIERENDER LINEAR SYSTEME]**

J. H. Argyris and B. Kirchgaessner 1982 162 p refs In GERMAN; ENGLISH summary

(Contract BMFT-ET-4406-A/B)

(ISD-293; ISSN-0170-6071) Avail: NTIS HC A08/MF A01

A program system for linear investigation of the dynamic behavior of wind energy converters is described. Tower and rotor are coupled modally to obtain linearized equations of motion of the entire system. The investigation of stability is performed according to Floquet's theory because these equations of motion contain cyclic coefficients. The theory, a program and some examples which were investigated are described. E.A.K.

**N83-17906#** Louisiana State Univ., Baton Rouge. Dept. of Physics and Astronomy.

**A THEORY OF NON-DEBYE RELAXATION IN CONDENSED MATTER**

K. L. Ngai and A. K. Rajagopal (NRL) 15 Nov. 1982 20 p refs Presented at the Meeting on Non-Debye Relaxation in Condensed Matter, Bangalore, India, 16-17 Sep. 1982

(Contract N00014-82-K-0477)

(AD-A121509) Avail: NTIS HC A02/MF A01 CSCL 20/8

This paper is an expository account of a theory of relaxation phenomena in condensed matter. Developed in detail is a picture of the relaxation process in condensed matter that shows that the time dependent transition rates (TDTR) are of paramount importance in giving rise to the non-Debye relaxation. It is suggested that the microscopic mechanism underlying this TDTR is another aspect of the heat bath with which the relaxing system is in contact, not considered before. The nature of the low-energy level spacings of the heat bath determine the long time relaxation process. Alternative procedures of arriving at the same TDTR are also discussed. GRA

**N83-17907#** Oak Ridge National Lab., Tenn. Engineering Technology Div.

**DESIGN CRITERIA FOR THE SPACING OF NOZZLES AND REINFORCED OPENINGS IN CYLINDRICAL NUCLEAR PRESSURE VESSELS AND PIPE**

S. E. Moore and J. L. Mershon Feb. 1982 125 p refs

(Contract W-7405-eng-26)

(DE82-007896; NUREG/CR-2308; ORNL-5809) Avail: NTIS HC A06/MF A01

The minimum separation distance between any two nozzle penetrations in a nuclear pressure vessel or piping system is governed by design rules given in the ASME Boiler and Pressure Vessel Code. A broad-based generic study of these rules was conducted to assess their validity and/or develop more appropriate rules as needed. The various rules given in the Code are not always consistent with its basic stress criteria and may be either unduly conservative or nonconservative depending on the dimensional details of a given design. A new separation rule was therefore developed and is presented in the form of proposed changes to the ASME Code. The new rule is based on a comprehensive collection of finite-element stress-analysis studies and experimental data that span the range of dimensional parameters permitted for the design of nozzles in cylindrical vessels. These include data for both isolated and closely spaced nozzles. The proposed rule was also examined by comparison with a detailed finite-element analysis study for the placement of an emergency core-cooling system nozzle in a prototypical four-loop pressurized-water-reactor pressure vessel. DOE

**N83-17908#** Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho. Materials Technology Div.

**EVALUATION OF THE CAPABILITIES OF VARIOUS ANALYTICAL TECHNIQUES TO PREDICT INTEGRITY OF STRUCTURAL COMPONENTS CONTAINING SURFACE FLAWS**

W. G. Reuter 1981 21 p refs

(Contract DE-AC07-76ID-01570)

(DE82-005953; CONF-810801-64) Avail: NTIS HC A02/MF A01

The influence of defects on structural component integrity in both experimental and commercial nuclear reactors is assessed. In order to improve the data base against which models may be tested and to gain information about the behavior of annealed Type 304 stainless steel in the presence of defects, a test program was conducted using surface flawed plate specimens and pressurized pipe specimens with internal and external surface defects. Five techniques used to analyze the test results are discussed. DOE

**N83-17909#** Massachusetts Inst. of Tech., Cambridge. Dept. of Nuclear Engineering.

**THE DEVELOPMENT OF A MINIATURIZED DISK-BEND TEST FOR THE DETERMINATION OF POSTIRRADIATION MECHANICAL PROPERTIES**

M. P. Manahan, A. S. Argon, and O. K. Harling 1981 6 p refs Presented at the Fusion Reactor Mater. Meeting, Seattle, 9 Aug. 1981

(Contract DE-AS02-78ER-10107)

(DE82-006751; DOE/ER-10107/12; CONF-810831-75) Avail: NTIS HC A02/MF A01

A miniaturized disk bend test capable of extracting postirradiation mechanical behavior information from disk-shaped specimens

no larger than those used for transmission electron microscopy is discussed. Finite element analysis is performed to convert the experimentally measured load-deflection data into useful engineering information. Since neutron irradiation costs scale with specimen volume, successful development of miniaturized mechanical property tests could provide significant savings in irradiation testing costs for nuclear materials used in fusion and other nuclear technologies. In addition, it may be possible to provide mechanical behavior information which is not ordinarily obtainable due to space limitations in irradiation experiments. DOE

**N83-17910#** Tennessee Univ., Knoxville. Dept. of Mathematics.
**CURVE FITTING AND UNCERTAINTY ANALYSIS OF CHARPY IMPACT DATA**
F. W. Stallmann Jan. 1982 27 p refs Prepared in cooperation with ORNL
(Contract W-7405-eng-26)
(DE82-005787; NUREG/CR-2408; ORNL/TM-8081) Avail: NTIS HC A03/MF A01

A method for the statistical evaluation of Charpy impact data is described. A multivariate linear least squares fit is used in which both dependent and independent variables may be subject to statistical variations. The input data are restricted to the transition region for the determination of nil ductility temperature (NDT) and to the upper-shelf region for the determination of the upper-shelf energy. Fluence, irradiation temperature, chemical composition, and other parameters may be included in the fit in order to process simultaneously large data sets and to estimate the dependence of delta RT/sub NDT and shift of upper-shelf energy on the parameters. DOE

**N83-17911#** Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.
**OBSERVATIONS OF THE SEVERITY OF NOTCH-ROOT RADIUS IN INITIATION OF SUBCRITICAL CRACK GROWTH**
W. G. Reuter, C. R. Eiholzer, and M. A. Tupper 1981 20 p refs Presented at the 6th Intern. Conf. on Structural Mech. in Reactor Technol., Paris, 17 Aug. 1981
(Contract DE-AC07-76ID-01570)
(DE82-005954; CONF-810801-58) Avail: NTIS HC A02/MF A01

Slow bend tests were conducted on Charpy specimens containing precracks or machined notches of 0.10 or 0.25 mm radius. The test specimens were fabricated from three heats of annealed Type 304 stainless steel. The purpose of these tests was to examine the effects of notch root radius in very ductile materials on initiation of subcritical crack growth. In addition, it was intended to establish the critical values of J, COD, etc., for the single-edge notch specimen for comparison with results obtained from specimens containing surface flaws. This paper will briefly describe only those results of the calculation for J. The tests were monitored by acoustic emission to identify the load corresponding to initiation of subcritical crack growth, by a crack-opening displacement gage (COD), by cross-head displacement, and by stop-action photography. DOE

**N83-17912#** Sandia Labs., Albuquerque, N. Mex.
**ACCURACY IN STRAIN MEASUREMENTS**
1982 9 p Presented as the Western Regional Strain Gage Committee of SESA Meeting, Torrance, Calif., 17 Feb. 1982
(Contract DE-AC04-76DP-00789)
(DE82-005681; SAND-82-0208C; CONF-820206-1) Avail: NTIS HC A02/MF A01

Strain measurements on massive steel structures when impacted by a high velocity projectile were analyzed. The event being simulated was the failure of a steam turbine rotor and its subsequent impact and/or penetration of the turbine casing, followed by impact and/or penetration of the outer shell. The simulated turbine casing is a steel plate 5 in. thick by 20 in. deep formed in a semicircle with a 14 ft diameter. Approximately 34 in. outside of the simulated turbine casing is the shell which is a steel plate 1 1/4 in. thick by 6 ft deep formed into a semicircle with a 20 ft diameter. The projectile was 105 deg segment of a steam turbine rotor weighting 3500 lbs. The rotor segment was impacted into the simulated turbine casing at a velocity of 490 ft/sec. DOE

**N83-17913#** Los Alamos Scientific Lab., N. Mex.
**MARGIN TO FAILURE. CATEGORY-1 STRUCTURES PROGRAM: BACKGROUND AND EXPERIMENTAL PROGRAM PLAN**
E. Endebrock, R. Dove, and C. A. Anderson Dec. 1981 62 p refs
(Contract W-7405-eng-36)
(DE82-010067; NUREG/CR-2347; LA-9030-MS) Avail: NTIS HC A04/MF A01

The background and justification for the Margins to Failure - Category-I Structures Program are presented. The results of a survey of selected architect/engineering firms engaged in the design of nuclear power plant faciiities are included. Computer codes and analytical methods that are used in assessing the margin to failure of Category-I structures are reviewed. A program plan whose goal is to obtain information about structural behavior or ultimate load, is proposed. This information is needed to make more reliable assessments of margins to failure. The proposed experimental structures are scaled reinforced concrete shear walls and scale model building systems. Types of loadings, test procedures, data interpretation, and test plans are discussed. DOE

**N83-17914#** Mason and Hanger-Silas Mason Co., Inc., Amarillo, Tex.
**MESUREMENT-SYSTEMS EVALUATION FOR THE SUPPORT CUSHION LIFE TEST PROGRAM**
Lawrence H. Rodin, Sidney E. Jasper, and Jimmy C. Myers Feb. 1982 39 p
(Contract DE-AC04-76DP-00487)
(DE82-011149; MHSMP-82-06; PDE-209) Avail: NTIS HC A03/MF A01

Accuracy and precision capabilities of the measurement systems used in the support cushion life test program were determined. The experiments were intended to expose any system weaknesses, and provide baseline data for continuous monitoring of the measurement systems during the life test program. The following systems are evaluated: Instron tension/compression tester system and the Kaman eddy current thickness measuring system. All primary functions of the systems like multiple independent functions for the Instron were evaluated. It is indicated that both systems are acceptable for use in the life test program. DOE

**N83-17915#** Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Unternehmensbereich Drehflueger.
**CONTRIBUTION OF THE CALCULATION OF ELASTOMER BEARINGS: MATERIALS THEORY AND APPLICATION OF THE FINITE ELEMENT METHOD [BEOTRAGE ZUR BERECHNUNG VON ELASTOMERLAGERN: MATERIALTHEORIE UND ANWENDUNG DER METHODE DER FINITEN ELEMENTE]**
C. Schliekmann 3 Feb. 1982 103 p refs In GERMAN
(MBB-UD-344-82-O) Avail: Issuing Activity

Elastomer behavior was described by a modified form of Hookes law (Herrmann formulation) for linear elastic investigations, and by the Mooney-Rivlin material equation in the physically nonlinear case. The hydrostatic pressure is an independent variable of state in these formulations. Numerical investigations of stress analysis and stiffness of elastomer bearings were performed by the programming system MARC. The finite element method results for realistic applications show that the proposed finite element model can be used for elastomer bearing calculations with rotationally symmetrical and nonrotationally symmetrical loads. Author (ESA)

# 42 GEOSCIENCES (GENERAL)

No abstracts in this category.

# 43 EARTH RESOURCES

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.

For instrumentation see *35 Instrumentation and Photography.*

**N83-17916*#** Environmental Research Inst. of Michigan, Ann Arbor.
**STUDY ON RADIOMETRIC CONSISTENCY OF LANDSAT-4 MULTISPECTRAL SCANNER Quarterly Status and Technical Progress Report, 22 Oct. 1982 - 21 Jan. 1983**
William A. Malila, Principal Investigator 21 Jan. 1983 42 p ERTS
(Contract NAS5-27254)
(E83-10099; NASA-CR-169676; NAS 1.26:169676; ERIM-163200-2-L; QSTPR-2) Avail: NTIS HC A03/MF A01 CSCL 14B

Two full frames of radiometrically corrected LANDSAT-4 MSS data were examined to determine a number of radiometric properties. It was found that LANDSAT-4 MSS produces data of good quality with dynamic ranges and target responses qualitatively similar to those of previous MSS sensors. Banding appears to be quite well corrected, with a residual rms error of about 0.3 digital counts being measured; the histogram equalization algorithm appears to be working as advertised. A low level coherent noise effect was found in all bands, appearing in uniform areas as a diagonal striping pattern. The principle component of this noise was found by Fourier analysis to be a highly consistent wavelength of 3.6 pixels along a scan line (28 KHz). The magnitude of this effect ranged from about 0.75 of one count in the worst band (Band 1) to only about 0.25 counts in the best band (Band 4). Preparations were made for establishing a relative radiometric calibration from MSS 4 data with respect to MSS 3. Author

**N83-17917*#** Indian Inst. of Geomagnetism, Bombay.
**MAGSAT FOR GEOMAGNETIC STUDIES OVER INDIAN REGION Progress Report, 1 Aug. - 30 Nov. 1982**
R. G. Rastogi, B. P. Singh, D. R. K. Rao, G. K. Rangarajan, R. Rajaram, M. Roy, and B. R. Arora, Principal Investigators 1 Dec. 1982 3 p Sponsored by NASA ERTS
(E83-10116; NASA-CR-169834; NAS 1.26:169834; PR-4) Avail: NTIS HC A02/MF A01 CSCL 05B

The external current field due to ring current and the associated induced part were removed. Adjacent passes over India were elected and best function to account for the trend correction was estimated. The UPCON software sent from Canada was made operational and features of equatorial electrojet were studied from MAGSAT records. Author

**N83-17918*#** Computer Sciences Corp., Silver Spring, Md.
**LANDSAT IMAGE DIFFERENCING AS AN AUTOMATED LAND COVER CHANGE DETECTION TECHNIQUE Interim Report**
M. L. Stauffer and R. L. McKinney Aug. 1978 31 p refs Original contains color imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS
(Contract NAS5-24350)
(E83-10129; NASA-CR-170476; NAS 1.26:170476; CSC/TM-78/6215) Avail: NTIS HC A03/MF A01 CSCL 05B

Image differencing was investigated as a technique for use with LANDSAT digital data to delineate areas of land cover change in an urban environment. LANDSAT data collected in April 1973 and April 1975 for Austin, Texas, were geometrically corrected and precisely registered to United States Geological Survey 7.5-minute quadrangle maps. At each pixel location reflectance values for the corresponding bands were subtracted to produce four difference images. Areas of major reflectance differences are isolated by thresholding each of the difference images. The resulting images are combined to obtain an image data set to total change. These areas of reflectance differences were found, in general, to correspond to areas of land cover change. Information on areas of land cover change was incorporated into a procedure to mask out all nonchange areas and perform an unsupervised classification only for data in the change areas. This procedure identified three broad categories: (1) areas of high reflectance (construction or extractive), (2) changes in agricultural areas, and (3) areas of confusion between agricultural and other areas. M.G.

**N83-17919*#** Indian Inst. of Geomagnetism, Bombay.
**ON LONG-WAVELENGTH MAGNETIC ANOMALIES OVER INDIAN REGION**
S. Srinivasan, L. Carlo, R. G. Rastogi, and B. P. Singh, Principal Investigators [1983] 1 p Sponsored by NASA ERTS
(E83-10135; NASA-CR-169763; NAS 1.26:169763) Avail: NTIS HC A02/MF A01 CSCL 05B

A data set composed of vector magnetic measurements obtained by MAGSAT and very accurate altitude determinations made using Sun sensors and star cameras was used to obtain data for very quiet days over the Indian region at 10 S to 40 N and 60 E to 110 E in an effort to determine the validity of quantitative estimates made from aeromagnetic data obtained by removing the core field. To further account for the external effects, the ring current contributions estimated using both X and Z variations were subtracted from the observed values. Before this, the core contribution was eliminated through a spherical harmonic expansion with terms up to N=13. Analysis of the residual measurements using Fast Fourier techniques indicates that the anomalies contain substantial power for wavelengths of about 1500 kms. Because the ring current effect has a spatial structure of this dimension over India, efforts are being made to exactly eliminate these two interfering effects from the data. A.R.H.

**N83-17920*#** Indian Inst. of Geomagnetism, Bombay.
**EQUATORIAL IONOSPHERIC CURRENTS DERIVED FROM MAGSAT DATA**
Manashi Roy, Principal Investigator [1983] 14 p refs Sponsored by NASA ERTS
(E83-10136; NASA-CR-169764; NAS 1.26:169764) Avail: NTIS HC A02/MF A01 CSCL 05B

The MAGSAT data on the three component's of the geomagnetic field are subjected to ring current correction and crustal anomaly elimination near the dip equator. The evidence of a strong west east electrojet current below the satellite height (approximately 350 km) is confirmed. Strong evidence of east-west component of the field suggests the existence of a vertical current originating at the jet level and extending upwards. A model calculation shows that such a current system can explain the satellite data as well as the ground data. Author

**N83-17921*#** California Univ., Berkeley.
**IRRIGATED LANDS ASSESSMENT FOR WATER MANAGEMENT: TECHNIQUE TEST Annual Report**
Sharon L. Wall, Catherine E. Brown, Marian Eriksson, Carolyn A. Grigg, Randall W. Thomas, Robert N. Colwell, John E. Estes (California Univ., Santa Barbara), Larry R. Tinney (California Univ., Santa Barbara), Jay O. Baggett (California Univ., Santa Barbara), Glenn Sawyer (California Dept. of Water Resources, Sacramento) et al Apr. 1981 342 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS
(Contract NCC2-54)
(E83-10154; NASA-CR-166370; NAS 1.26:166370) Avail: NTIS HC A15/MF A01 CSCL 08H

A procedure for estimating irrigated land using full frame LANDSAT imagery was demonstrated. Relatively inexpensive interpretation of multidate LANDSAT photographic enlargements

was used to produce a map of irrigated land in California. The LANDSAT and ground maps were then linked by regression equations to enable precise estimation of irrigated land area by county, basin, and statewide. Land irrigated at least once in California in 1979 was estimated to be 9.86 million acres, with an expected error of less than 1.75% at the 99% level of confidence. To achieve the same level of error with a ground-only sample would have required 3 to 5 times as many ground sample units statewide. A procedure for relatively inexpensive computer classification of LANDSAT digital data to irrigated land categories was also developed. This procedure is based on ratios of MSS band 7 and 5, and gave good results for several counties in the Central Valley. Author

**N83-17922*#** Kentron International, Inc., Hampton, Va.
**KERR RESERVOIR LANDSAT EXPERIMENT ANALYSIS FOR MARCH 1981**
Stuart R. LeCroy, Principal Investigator Hampton, Va. NASA. Langley Research Center Jul. 1982 55 p refs ERTS
(Contract NAS1-16000)
(E83-10155; NASA-CR-165959; NAS 1.26:165959) Avail: NTIS HC A04/MF A01 CSCL 08H

LANDSAT radiance data were used in an experiment conducted on the waters of Kerr Reservoir to determine if reliable algorithms could be developed that relate water quality parameters to remotely sensed data. A mix of different types of algorithms using the LANDSAT bands was generated to provide a thorough understanding of the relationships among the data involved. Except for secchi depth, the study demonstrated that for the ranges measured, the algorithms that satisfactorily represented the data encompass a mix of linear and nonlinear forms using only one LANDSAT band. Ratioing techniques did not improve the results since the initial design of the experiment minimized the errors against which this procedure is effective. Good correlations were found for total suspended solids, iron, turbidity, and secchi depth. Marginal correlations were discovered for nitrate and tannin + lignin. Quantification maps of Kerr Reservoir are presented for many of the water quality parameters using the developed algorithms. A.R.H.

**N83-17923*#** MacDonald, Dettwiler and Associates Ltd., Richmond (British Columbia).
**SEASAT SAR PERFORMANCE EVALUATION STUDY Final Report**
Jun. 1982 65 p refs Prepared for JPL, Pasadena, Calif. Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS
(Contracts NAS7-100; JPL-9566104)
(E83-10157; NASA-CR-169768; JPL-9950-699; NAS 1.26:169768; Rept-00-0676-D00) Avail: NTIS HC A04/MF A01 CSCL 05B

The performance of the SEASAT synthetic aperture radar (SAR) sensor was evaluated using data processed by the MDA digital processor. Two particular aspects are considered the location accuracy of image data, and the calibration of the measured backscatter amplitude of a set of corner reflectors. The image location accuracy was assessed by selecting identifiable targets in several scenes, converting their image location to UTM coordinates, and comparing the results to map sheets. The error standard deviation is measured to be approximately 30 meters. The amplitude was calibrated by measuring the responses of the Goldstone corner reflector array and comparing the results to theoretical values. A linear regression of the measured against theoretical values results in a slope of 0.954 with a correlation coefficient of 0.970. A.R.H.

**N83-17924*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
**OFF-NADIR ANTENNA BIAS CORRECTION USING AMAZON RAIN FOREST SIGMA DEG DATA**
I. J. Birrer, E. M. Bracalente, G. J. Dome (Bell Labs., Holmdel, N.J.), J. Sweet, G. Berthold, and R. K. Moore, Principal Investigators Oct. 1981 69 p refs Prepared in cooperation with Kansas Univ. Center for Research, Inc., Lawrence ERTS
(Grant NsG-1397)
(E83-10158; NASA-TM-85217; NAS 1.15:85217; RSL-TR-343-6) Avail: NTIS HC A04/MF A01 CSCL 02F

The radar response from the Amazon rain forest was studied to determine the suitability of this region for use as a standard target to calibrate a scatterometer like that proposed for the National Ocean Satellite System (NOSS). Backscattering observations made by the SEASAT-1 scatterometer system show the Amazon rain forest to be a homogeneous, azimuthally-isotropic, radar target which is insensitive to polarization. The variation with angle of incidence may be adequately modeled as sigma deg (dB) = alpha theta + beta with typical values for the incidence-angle coefficient from 0.07 dB deg to 0.15 dB/deg. A small diurnal effect occurs, with measurements at sunrise being 0.5 dB to 1 dB higher than the rest of the day. Maximum likelihood estimation algorithms are presented which permit determination of relative bias and true pointing angle for each beam. Specific implementation of these algorithms for the proposed NOSS scatterometer system is also discussed. Author

**N83-17925*#** California Inst. of Tech., Pasadena.
**DEVELOPMENT OF MATHEMATICAL TECHNIQUES FOR THE ASSIMILATION OF REMOTE SENSING DATA INTO ATMOSPHERIC MODELS Final Technical Report**
John H. Seinfeld, Principal Investigator [1982] 106 p refs ERTS
(Grant NAG1-71)
(E83-10159; NASA-CR-169769; NAS 1.26:169769) Avail: NTIS HC A06/MF A01 CSCL 05B

The problem of the assimilation of remote sensing data into mathematical models of atmospheric pollutant species was investigated. The problem is posed in terms of the matching of spatially integrated species burden measurements to the predicted three dimensional concentration fields from atmospheric diffusion models. General conditions are derived for the 'reconstructability' of atmospheric concentration distributions from data typical of remote sensing applications, and a computational algorithm (filter) for the processing of remote sensing data is developed. M.G.

**N83-17926*#** Technicolor Government Services, Inc., Moffett Field, Calif.
**FORESTRY TIMBER TYPING. TANANA DEMONSTRATION PROJECT, ALASKA ASVT Final Report**
Leslie A. Morrissey and Vincent G. Ambrosia Jun. 1982 72 p refs Original contains color imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS
(Contract NAS2-11101)
(E83-10162; NASA-CR-166391; NAS 1.26:166391) Avail: NTIS HC A04/MF A01 CSCL 02F

The feasibility of using LANDSAT digital data in conjunction with topographic data to delineate commercial forests by stand size and crown closure in the Tanana River basin of Alaska was tested. A modified clustering approach using two LANDSAT dates to generate an initial forest type classification was then refined with topographic data. To further demonstrate the ability of remotely sensed data in a fire protection planning framework, the timber type data were subsequently integrated with terrain information to generate a fire hazard map of the study area. This map provides valuable assistance in initial attack planning, determining equipment accessibility, and fire growth modeling. The resulting data sets were incorporated into the Alaska Department of Natural Resources geographic information system for subsequent utilization. A.R.H.

**N83-17927*#** Technicolor Government Services, Inc., Moffett Field, Calif.
**ANALYSIS OF THE TANANA RIVER BASIN USING LANDSAT DATA**
Leslie A. Morrissey, Vincent G. Ambrosia, and Charlotte Carson-Henry Apr. 1981 50 p Prepared in cooperation with Alaska Dept. of Natural Resources, Anchorage Original contains color imagery. Original photography may be purchased from the EROS

Data Center, Sioux Falls, S.D. 57198 ERTS
(Contract NAS2-11101)
(E83-10163; NASA-CR-166393; NAS 1.26:166393) Avail: NTIS HC A03/MF A01 CSCL 08H

Digital image classification techniques were used to classify land cover/resource information in the Tanana River Basin of Alaska. Portions of four scenes of LANDSAT digital data were analyzed using computer systems at Ames Research Center in an unsupervised approach to derive cluster statistics. The spectral classes were identified using the IDIMS display and color infrared photography. Classification errors were corrected using stratification procedures. The classification scheme resulted in the following eleven categories; sedimented/shallow water, clear/deep water, coniferous forest, mixed forest, deciduous forest, shrub and grass, bog, alpine tundra, barrens, snow and ice, and cultural features. Color coded maps and acreage summaries of the major land cover categories were generated for selected USGS quadrangles (1:250,000) which lie within the drainage basin. The project was completed within six months. Author

**N83-17928*#** OAO Corp., Greenbelt, Md.
**LANDSAT-D REFURBISHMENT STUDY**
Jul. 1980 97 p refs ERTS
(Contract NASw-3358)
(E83-10164; NASA-CR-169770; NAS 1.26:169770;
OAO/TR-80/0104) Avail: NTIS HC A05/MF A01 CSCL 22B

Requirements for refurbishing the LANDSAT-D spacecraft after its recovery from orbit at the end of a 3-year mission in order to reuse the spacecraft on a second 3-year mission were studied. A schedule of the time required for the refurbishment including the procurement cycle for long lead-time items is developed. The costs of refurbishing and of procuring an entirely new LANDSAT-D spacecraft are compared. A.R.H.

**N83-17929*#** OAO Corp., Beltsville, Md.
**HEAD CAPACITY MAPPING MISSION (HCMM) NOTIFICATION EFFORTS Final Report**
30 Oct. 1980 72 p Original contains imagery. Original imagery may be purchased from NASA Goddard Space Flight Center, (code 601), Greenbelt, Md. 20770. Domestic users send orders to "Attn: National Space Science Data Center"; non-domestic users send orders to "Attn: World Data Center A for Rockets and Satellites". HCMM
(Contract NASw-3358)
(E83-10165; NASA-CR-169771; NAS 1.26:169771;
OAO-TR/80/0072) Avail: NTIS HC A04/MF A01 CSCL 08B

To encourage wide use of the Heat Capacity Mapping Mission (HCMM) data, especially among the scientific community, special notifications were prepared to inform them about the data's availability, its form, and the procedures for obtaining them. To achieve the widest distribution to the primary audiences of interest, mailings were made to scientists associated with the OSTA Resource Observation Division programs and to scientific and professional societies and journals. Accompanying the notifications to the societies and journals were samples of the HCMM imagery and a description of the image's predominant characteristics. A follow-up survey was completed to determine the effectiveness of the HCMM notifications. M.G.

**N83-17930*#** Florida Univ., Gainesville. Inst. of Food and Agricultural Sciences.
**DISTRICT WIDE WATER RESOURCES INVESTIGATION AND MANAGEMENT USING LANDSAT DATA. PHASE 1: LAKE VOLUME Final Report**
S. F. Shih, Principal Investigator Mar. 1982 94 p refs Sponsored by NASA and St. Johns River Water Management District Original contains color imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS
(E83-10166; NASA-CR-166828; NAS 1.26:166828;
DSR-8-1006cg-1) Avail: NTIS HC A05/MF A01 CSCL 08H

A technique for estimating available water storage volume using LANDSAT data was developed and applied to Lake Washington and Lake Harris in central Florida. The technique can be applied two ways. First, where the historical stage records are available, the historical LANDSAT data can be used to establish the relationship between lake volume and lake stage. In the second case, where the historical stage records are not available, the historical LANDSAT data can be used to estimate the historical lake stage after the lake volume and stage information become available in the future. M.G.

**N83-17931*#** OAO Corp., Greenbelt, Md.
**ASSESSMENT OF THE AVAILABILITY OF THE TRACKING AND DATA RELAY SATELLITE SYSTEM FOR LANDSAT MISSIONS**
Apr. 1982 90 p ERTS
(Contract NASw-3358)
(E83-10167; NASA-CR-169777; NAS 1.26:169777;
OAO/TR-82/0027) Avail: NTIS HC A05/MF A01 CSCL 22B

The telecommunications availability that can realistically be provided by the tracking and data relay satellite system (TDRSS) for LANDSAT D type missions. Although the assessment focusses on the telecommunications requirements of the near Earth orbit missions of the 1985 - 1989 time frame, it emphasizes LANDSAT D and its competing demand for wideband, real-time RF link services from TDRSS. Limitations in availability of communications services are identified, including systematic TDRSS restrictions, conflicting telecommunication requirements and loading problems of all users (missions) which are to be supported by TDRSS. Several telecommunications alternatives for LANDSAT D utilization independent of TDRSS services are discussed. A.R.H.

**N83-17932*#** Geogroup, Berkeley, Calif.
**OPERATIONAL ALTERNATIVES FOR LANDSAT IN CALIFORNIA Annual Report**
Paul Wilson and M. J. Gialdini Jul. 1981 80 p refs ERTS
(Contract NAS2-11099)
(E83-10168; NASA-CR-166353; NAS 1.26:166353) Avail: NTIS HC A05/MF A01 CSCL 08B

Data integration is defined and examined as the means of promoting data sharing among the various governmental and private geobased information systems in California. Elements of vertical integration considered included technical factors (such as resolution and classification) and institutional factors (such as organizational control, and legal and political barriers). Attempts are made to fit the theoretical elements of vertical integration into a meaningful structure for looking at the problem from a statewide focus. Both manual (mapped) and machine readable data systems are included. Special attention is given to LANDSAT imagery because of its strong potential for integrated use and its primary in the California Integrated Remote Sensing System program. A.R.H.

**N83-17933*#** California Univ., Santa Barbara. Geography Remote Sensing Unit.
**PRIME AGRICULTURAL LAND MONITORING AND ASSESSMENT COMPONENT OF THE CALIFORNIA INTEGRATED REMOTE SENSING SYSTEM Final Report**
John E. Estes, Larry Tinney, Principal Investigators, and Tod Streich Sep. 1981 32 p ERTS
(Grant NAG2-24)
(E83-10169; NASA-CR-166371; NAS 1.26:166371; ) Avail: NTIS HC A03/MF A01 CSCL 02C

The use of digital LANDSAT techniques for monitoring agricultural land use conversions was studied. Two study areas were investigated: one in Ventura County and the other in Fresno County (California). Ventura test site investigations included the use of three dates of LANDSAT data to improve classification performance beyond that previously obtained using single data techniques. The 9% improvement is considered highly significant. Also developed and demonstrated using Ventura County data is an automated cluster labeling procedure, considered a useful example of vertical data integration. Fresno County results for a single data LANDSAT classification paralleled those found in Ventura, demonstrating that the urban/rural fringe zone of most interest is a difficult environment to classify using LANDSAT data. A general raster to vector conversion program was developed to allow LANDSAT classifica-

tion products to be transferred to an operational county level geographic information system in Fresno. M.G.

**N83-17934*#** OAO Corp., Greenbelt, Md.
**ANALYSIS AND FIFTEEN-YEAR PROJECTION OF THE MARKET FOR LANDSAT DATA**
18 Sep. 1981 24 p refs ERTS
(Contract NASw-3358)
(E83-10170; NASA-CR-169778; NAS 1.26:169778; OAO/TR-81/0057) Avail: NTIS HC A02/MF A01 CSCL 05B

The potential market for LANDSAT products through the 1990's was determined. Results are presented in a matrix format. Improved resolution is a major factor in the marketability of LANDSAT data, the 10 meter resolution (projected for 1995) having a significant impact on the federal, private, and international users, and on the agricultural, minerals, and national defense applications. Data delivery time and competition from the French remote sensing system are considered. M.G.

**N83-17935*#** California Univ., Santa Barbara. Geography Remote Sensing Unit.
**USE OF COLLATERAL INFORMATION TO IMPROVE LANDSAT CLASSIFICATION ACCURACIES Final Report, 1 Apr. 1979 - 31 Mar. 1981**
Alan H. Strahler, Principal Investigator 31 Mar. 1981 197 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS
(Grant NsG-2377)
(E83-10171; NASA-CR-169779; NAS 1.26:169779) Avail: NTIS HC A09/MF A01 CSCL 05B

Methods to improve LANDSAT classification accuracies were investigated including: (1) the use of prior probabilities in maximum likelihood classification as a methodology to integrate discrete collateral data with continuously measured image density variables; (2) the use of the logit classifier as an alternative to multivariate normal classification that permits mixing both continuous and categorical variables in a single model and fits empirical distributions of observations more closely than the multivariate normal density function; and (3) the use of collateral data in a geographic information system as exercised to model a desired output information layer as a function of input layers of raster format collateral and image data base layers. M.G.

**N83-17936*#** Oceanweather, Inc., White Plains, N.Y.
**EVALUATION OF SEASAT-A SMMR DERIVED WIND SPEED MEASUREMENTS Final Report**
Jan. 1982 41 p refs Sponsored by NASA Prepared for JPL, Pasadena Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS
(Contract JPL-955583)
(E83-10172; NASA-CR-169782; JPL-9950-666; NAS 1.26:169782) Avail: NTIS HC A03/MF A01 CSCL 04B

Wind speeds derived from versions of the least-squares and regression algorithms developed after the JASIN Workshop were evaluated. The accuracy of scanning multichannel microwave radiometer (SMMR) wind retrievals was determined in terms of the intrinsic accuracy of a baseline surface truth data set in favorable conditions. Effects which degrade the wind retrievals or introduce biases were indentified and assessed. The performance of the SMMR in storms was ascertained with particular emphasis on the effects of rain. A.R.H.

**N83-17937*#** Colorado State Univ., Fort Collins. Dept. of Earth Resources.
**URBAN AREA CHANGE DETECTION PROCEDURES WITH REMOTE SENSING DATA Final Report**
Eugene L. Maxwell, Principal Investigator and Carol J. Riordan 26 Nov. 1980 79 p refs ERTS
(Contract NAS5-26127)
(E83-10174; NASA-CR-170440; NAS 1.26:170440) Avail: NTIS HC A05/MF A01 CSCL 05B

The underlying factors affecting the detection and identification of nonurban to urban land cover change using satellite data were studied. Computer programs were developed to create a digital scene and to simulate the effect of the sensor point spread function (PSF) on the transfer of modulation from the scene to an image of the scene. The theory behind the development of a digital filter representing the PSF is given as well as an example of its application. Atmospheric effects on modulation transfer are also discussed. A user's guide and program listings are given. M.G.

**N83-17938*#** General Software Corp., Landover, Md.
**THE CONICAL SCANNER EVALUATION SYSTEM DESIGN**
Karen E. Cumella, Stephen Bilanow, and Igor B. Kulikov May 1982 187 p refs ERTS
(Contract NAS5-26205)
(E83-10175; NASA-CR-170439; NAS 1.26:170439; GSC-TR8206) Avail: NTIS HC A09/MF A01 CSCL 14B

The software design for the conical scanner evaluation system is presented. The purpose of this system is to support the performance analysis of the LANDSAT-D conical scanners, which are infrared horizon detection attitude sensors designed for improved accuracy. The system consists of six functionally independent subsystems and five interface data bases. The system structure and interfaces of each of the subsystems is described and the content, format, and file structure of each of the data bases is specified. For each subsystem, the functional logic, the control parameters, the baseline structure, and each of the subroutines are described. The subroutine descriptions include a procedure definition and the input and output parameters. M.G.

**N83-17939*#** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
**SUMMARY OF RESEARCH ADDRESSING THE POTENTIAL UTILITY OF THEMATIC MAPPER DATA FOR RENEWABLE RESOURCE APPLICATIONS**
J. R. Irons Jul. 1982 47 p refs Submitted for publication ERTS
(E83-10176; NASA-TM-83965; NAS 1.15:83965) Avail: NTIS HC A03/MF A01 CSCL 05B

LANDSAT-D, scheduled for launch in July 1982, will carry a multispectral scanner subsystem (MSS) similar to that flown on earlier missions, as well as a new multispectral scanner called the thematic mapper (TM). The TM will offer improvements over the MSS with respect to spectral, spatial, and radiometric characteristics. In preparation for the delivery of actual TM data, extensive research was conducted using simulated TM data. From a review of this research, it is concluded that: TM's improved radiometric resolution is a valuable sensor attribute; the availability of spectral bands from each portion of the reflective spectrum (visible, near-infrared, middle-infrared) is very useful; and TM's finer spatial resolution enables the identification of smaller spatial features. Research to develop improved classifiers which take full advantage of finer spatial resolution data is needed. The collective effect of the TM's improvements is an increase in the content and utility of information extracted from TM data when compared to information derived from MSS data. Author

**N83-17940*#** Kansas Univ. Center for Research, Inc., Lawrence. Remote Sensing Lab.
**ADAPTIVE FILTERING OF RADAR IMAGES FOR AUTOFOCUS APPLICATIONS Final Report**
J. A. Stiles, V. S. Frost, J. S. Gardner, D. R. Eland, K. S. Shanmugam, and J. C. Holtzman Jun. 1981 39 p Sponsored by NASA Prepared for JPL, Pasadena, Calif. Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS
(Contract JPL-955851)
(E83-10177; NASA-CR-169784; NAS 1.26:169784; RSL-TR-489-1) Avail: NTIS HC A03/MF A01 CSCL 17I

Autofocus techniques are being designed at the Jet Propulsion Laboratory to automatically choose the filter parameters (i.e., the focus) for the digital synthetic aperture radar correlator; currently, processing relies upon interaction with a human operator who uses his subjective assessment of the quality of the processed

SAR data. Algorithms were devised applying image cross-correlation to aid in the choice of filter parameters, but this method also has its drawbacks in that the cross-correlation result may not be readily interpretable. Enhanced performance of the cross-correlation techniques of JPL was hypothesized given that the images to be cross-correlated were first filtered to improve the signal-to-noise ratio for the pair of scenes. The results of experiments are described and images are shown. Author

**N83-17941*#** New South Wales Univ., Kensington (Australia).
**A COMPUTER ANALYSIS OF ERTS DATA OF THE LAKE GREGORY AREA OF SOUTH AUSTRALIA WITH PARTICULAR EMPHASIS ON ITS ROLE IN TERRAIN CLASSIFICATION FOR ENGINEERING M.S. Thesis**
G. D. Lodwick, Principal Investigator 1976 278 p refs Sponsored by NASA Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS
(E83-10178; NASA-CR-169785; NAS 1.26:169785) Avail: NTIS HC A13/MF A01 CSCL 05B

A digital computer and multivariate statistical techniques were used to analyze 4-band multispectral data. A representation of the original data for each of the four bands allows a certain degree of terrain interpretation; however, variations in appearance of sites within and between bands, without additional criteria for deciding which representation should be preferred, create difficulties for classification. Investigation of the video data groups produced by principal components analysis and cluster analysis techniques shows that effective correlations with classifications of terrain produced by conventional methods could be carried out. The analyses also highlighted underlying relationships between the various elements. The approach used allows large areas (185 cm by 185 cm) to be classified into fundamental units within a matter of hours and can be applied to those parts of the Earth where facilities for conventional studies are poor or lacking. A.R.H.

**N83-17942*#** Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
**CORSE-81: THE 1981 CONFERENCE ON REMOTE SENSING EDUCATION**
Shirley M. Davis, comp. 1981 375 p refs Conf. held in Lafayette, Ind., 18-22 May 1981 Sponsored by NASA and NOAA Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS
(E83-10179; NASA-CP-2197; NAS 1.55:2197) Avail: NTIS HC A16/MF A01 CSCL 05I

Summaries of the presentations and tutorial workshops addressing various strategies in remote sensing education are presented. Course design from different discipline perspectives, equipment requirements for image interpretation and processing, and the role of universities, private industry, and government agencies in the education process are covered. For individual titles, see N83-17943 through N83-17989.

**N83-17943*#** New Mexico Univ., Albuquerque. Technology Application Center.
**SURVEY OF INSTRUCTIONAL MATERIAL FOR REMOTE SENSING**
Stanley A. Morain *In* Purdue Univ. CORSE-81: The 1981 Conf. on Remote Sensing Educ. 1981 p 45-49 refs ERTS (For primary document see N83-17942 08-43)
Avail: NTIS HC A16/MF A01 CSCL 05I

The contents of 17 major textbooks and reference guides on remote sensing technology are listed and compared. As a group, these books concentrate more on principles of the electromagnetic spectrum, sensors and data processing, than on applications. Secondly, it appears that basic photointerpretation receives considerable attention, but that photogrammetry does not. Four texts which provide well-rounded treatments of the systematics of remote sensing are suggested. M.G.

**N83-17944*#** Idaho Univ., Moscow. Coll. of Forestry, Wildlife and Range Sciences.
**EQUIPMENT AND APPROACHES FOR TEACHING VISUAL IMAGE INTERPRETATION**
Joseph J. Ulliman *In* Purdue Univ. CORSE-81: The 1981 Conf. on Remote Sensing Educ. 1981 p 50-55 refs ERTS (For primary document see N83-17942 08-43)
Avail: NTIS HC A16/MF A01 CSCL 05I

The equipment needs for teaching a visual image interpretation course, and the advantages and limitations of using multimedia and programmed teaching approaches are discussed. M.G.

**N83-17945*#** Wisconsin Univ., Madison. Dept. of Civil and Environmental Engineering.
**REMOTE SENSING PROGRAMS AND COURSES IN ENGINEERING AND WATER RESOURCES**
Ralph W. Kiefer *In* Purdue Univ. CORSE-81: The 1981 Conf. on Remote Sensing Educ. 1981 p 60-64 ref ERTS (For primary document see N83-17942 08-43)
Avail: NTIS HC A16/MF A01 CSCL 05I

The content of typical basic and advanced remote sensing and image interpretation courses are described and typical remote sensing graduate programs of study in civil engineering and in interdisciplinary environmental remote sensing and water resources management programs are outlined. Ideally, graduate programs with an emphasis on remote sensing and image interpretation should be built around a core of five courses: (1) a basic course in fundamentals of remote sensing upon which the more specialized advanced remote sensing courses can build; (2) a course dealing with visual image interpretation; (3) a course dealing with quntitative (computer-based) image interpretation; (4) a basic photogrammetry course; and (5) a basic surveying course. These five courses comprise up to one-half of the course work required for the M.S. degree. The nature of other course work and thesis requirements vary greatly, depending on the department in which the degree is being awarded. M.G.

**N83-17946*#** Purdue Univ., Lafayette, Ind. Dept. of Electrical Engineering.
**THE QUANTITATIVE METHODOLOGY OF REMOTE SENSING: AN EDUCATOR'S PERSPECTIVE**
Philip H. Swain *In its* CORSE-81: The 1981 Conf. on Remote Sensing Educ. 1981 p 65-67 ref ERTS (For primary document see N83-17942 08-43)
Avail: NTIS HC A16/MF A01 CSCL 05I

Strategies for teaching the fundamentals of quantitative remote sensing to students from diverse disciplines and with a broad range of mathematical backgrounds are described. Because the concepts are fairly abstract and complex, the successful educator must take care to motivate and assist the students in mastering the concepts. He/she should strive to communicate intuitive notions of the concepts couched in settings as familiar as possible and use these settings to illustrate each mathematical or statistical formulation which is introduced. The utilization of laboratory-type experiences and lectures from experts is also suggested. M.G.

**N83-17947*#** Minnesota Univ., St. Paul. Coll. of Forestry.
**REMOTE SENSING TRAINING NEEDS IN PROFESSIONAL FOREST AND RANGE RESOURCE MANAGEMENT CURRICULA**
Merle P. Meyer *In* Purdue Univ. CORSE-81: The 1981 Conf. on Remote Sensing Educ. 1981 p 68-71 ERTS (For primary document see N83-17942 08-43)
Avail: NTIS HC A16/MF A01 CSCL 05I

The status of remote sensing training in accredited U.S. forestry schools is reviewed. It is noted that there is a serious lack of emphasis on aerial photography and aerial photointerpretation in the current curricula. This lack of training at the professional school limits entering employee capability and necessitates expensive on-the-job training. M.G.

**N83-17948*#** California Univ., Santa Barbara. Dept. of Geography.
**THE REQUIREMENTS OF TEACHING AN INTERDISCIPLINARY TECHNOLOGY FROM THE GEOGRAPHIC PERSPECTIVE**

John E. Estes *In* Purdue Univ. CORSE-81: The 1981 Conf. on Remote Sensing Educ. 1981 p 72-76 refs ERTS (For primary document see N83-17942 08-43)
Avail: NTIS HC A16/MF A01 CSCL 05I

The growth of remote sensing course offerings within geography is reviewed and the impact of remote sensing on the discipline is discussed. M.G.

**N83-17949*#** California Univ., Los Angeles. Dept. of Earth and Space Sciences.
**GEOLOGICAL APPLICATIONS AND TRAINING IN REMOTE SENSING**
Floyd F. Sabins, Jr. *In* Purdue Univ. CORSE-81: The 1981 Conf. on Remote Sensing Educ. 1981 p 77-82 Prepared in cooperation with Chevron Oil Field Research Co., La Habra, Calif. Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS (For primary document see N83-17942 08-43)
Avail: NTIS HC A16/MF A01 CSCL 05I

Some of the experiences, methods, and opinions developed during 15 years of teaching an introductory course in remote sensing at several universities in the Southern California area are related. Although the course is offered in Geology departments, every class includes significant numbers of students from other disciplines including geography, computer science, biology, and environmental science. The instructor or teaching assistant provides a few hours of tutorial lectures (outside of regular class time) on basic geology for these nongeologists. This approach is successful because the grade distribution for nongeologists is similar to that for geologists. The schedule for a typical one-semester course is given. M.G.

**N83-17950*#** East Carolina Univ., Greenville, N.C. Dept. of Geography and Planning.
**SOME CHARACTERISTICS AND ADVANTAGES OF LANDSAT 3 RETURN BEAM VIDICON IMAGES**
Simon Baker *In* Purdue Univ. CORSE-81: The 1981 Conf. on Remote Sensing Educ. 1981 p 84-85 refs ERTS (For primary document see N83-17942 08-43)
Avail: NTIS HC A16/MF A01 CSCL 14B

One advantage of a LANDSAT 3 return beam vidicon (RBV) scene is the synoptic view it provides. A 1:500,000 paper print of the size 19.4 cm x 19.4 cm encompasses an area of about 3,721 square miles (9,637 sq. km.) and this compares very favorably in coverage to small scale aerial photography. A second important advantage is that the ground resolution is 38 by 38 meters. Compared to the resolution of the MSS which is 79 by 79 meters the RBV provides a wealth of detail useful for many purposes. A great variety of man made structures are visible including bridges, roads, docks, and small airfields. Agricultural field patterns are clear and settlements of various sizes can be identified and delineated. A third advantage is related to the approximate panchromatic spectral response displayed in RBV images. Since many aerial photographic interpreters are accustomed to working with panchromatic photographs, they should have no difficulty understanding and putting RBV images immediately into use. M.G.

**N83-17951*#** Ohio Univ., Athens.
**REMOTE SENSING: PRESENT AND FUTURE**
H. H. L. Bloemer *In* Purdue Univ. CORSE-81: The 1981 Conf. on Remote Sensing Educ. 1981 p 87-92 refs ERTS (For primary document see N83-17942 08-43)
Avail: NTIS HC A16/MF A01 CSCL 05B

Satellite remote sensing technology is overviewed with particular emphasis on the present and planned LANDSAT satellite systems. Satellite-borne instrumentation and their capabilities are discussed including multispectral scanners, return beam vidicons, the thermal inertia mapper, and STEREOSAT instrumentation. M.G.

**N83-17952*#** Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
**CUSTOMIZED REMOTE SENSING SHORT COURSES**
Shirley M. Davis and Luis A. Bartolucci *In its* CORSE-81: The 1981 Conf. on Remote Sensing Educ. 1981 p 93-101 ref ERTS (For primary document see N83-17942 08-43)
Avail: NTIS HC A16/MF A01 CSCL 05I

The advantages of customized courses over general purpose courses are outlined. The development of course objectives and content and the incorporation of hands-on exercises are discussed. Criteria for ensuring the quality of the course are also defined. M.G.

**N83-17953*#** Oregon State Univ., Corvallis. Environmental Remote Sensing Applications Lab.
**PERFORMING AND UPDATING AN INVENTORY OF OREGON'S EXPANDING IRRIGATED AGRICULTURAL LANDS UTILIZING REMOTE SENSING TECHNOLOGY**
Madeline J. Hall *In* Purdue Univ. CORSE-81: The 1981 Conf. on Remote Sensing Educ. 1981 p 103-107 refs ERTS (For primary document see N83-17942 08-43)
Avail: NTIS HC A16/MF A01 CSCL 02C

An inventory technique based upon using remote sensing technology, interpreting both high altitude aerial photography and LANDSAT multispectral scanner imagery, is discussed. It is noted that once the final land use inventory maps of irrigated agricultural lands are available and approximately scaled they may be overlaid directly onto either multispectral scanner or return beam vidicon prints, thereby providing an inexpensive updating procedure. M.G.

**N83-17954*#** Oklahoma Univ., Norman. Dept. of Geography.
**LOW-COST DIGITAL IMAGE PROCESSING AT THE UNIVERSITY OF OKLAHOMA**
John A. Harrington, Jr. *In* Purdue Univ. CORSE-81: The 1981 Conf. on Remote Sensing Educ. 1981 p 108-112 refs ERTS (For primary document see N83-17942 08-43)
(Contracts NAS13-85; NAS13-122; NAS13-156)
Avail: NTIS HC A16/MF A01 CSCL 05B

Computer assisted instruction in remote sensing at the University of Oklahoma involves two separate approaches and is dependent upon initial preprocessing of a LANDSAT computer compatible tape using software developed for an IBM 370/158 computer. In-house generated preprocessing algorithms permits students or researchers to select a subset of a LANDSAT scene for subsequent analysis using either general purpose statistical packages or color graphic image processing software developed for Apple II microcomputers. Procedures for preprocessing the data and image analysis using either of the two approaches for low-cost LANDSAT data processing are described. M.G.

**N83-17955*#** State Univ. of New York, Geneseo. Dept. of Geography.
**GROUND PHOTOGRAPHY FOR IMPROVVED IMAGE INTERPRETATION TRAINING**
Ray Lougeay *In* Purdue Univ. CORSE-81: The 1981 Conf. on Remote Sensing Educ. 1981 p 115-119 ERTS (For primary document see N83-17942 08-43)
Avail: NTIS HC A16/MF A01 CSCL 14E

Systematic sets of ground based color and color infrared photography were presented to students in remote sensing classes to enhance their ability to interpret satellite images. Features readily apparent on computer enhanced LANDSAT images were presented simultaneously with ground based photography in the format of slide triplicates. It was hypothesized that this instructional approach would improve the students' abilities to recognize, understand and interpret ground phenomena present on remotely sensed imagery. Tests conducted in undergraduate remote sensing classes substantially upheld this hypothesis. Student image interpretive abilities were tested before and after being exposed to the ground level photography. In general, image interpretive skills of the class improved by 25%. Also, the performance of students having different academic majors varied greatly for differing types of image subjects. M.G.

**N83-17956*#** Ohio State Univ., Columbus.
**LABORATORY EXERCISES, REMOTE SENSING OF THE ENVIRONMENT**
Olin Mintzer and John Ray *In* Purdue Univ. CORSE-81: The 1981 Conf. on Remote Sensing Educ. 1981 p 120-126 Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS (For primary document see N83-17942 08-43)
Avail: NTIS HC A16/MF A01 CSCL 13B

The exercises are designed to convey principles and theory of remote sensing, and methodologies of its application to civil engineering and environmental concerns, including agronomy, geography, geology, wildlife, forestry, hydrology, and other related fields. During the exercises the student is introduced to several types of remote sensing represented by imagery from conventional format: panchromatic, black-and-white infrared, color, and infrared, 35mm aerial photography, thermal infrared, radar, multispectral scanner, and LANDSAT. Upon completion of the exercises the student is expected to know: (1) the electromagnetic spectrum, its various wavelength sub-sections and their uses as sensors, (2) the limitations of each sensor, (3) the interpretation techniques used for extracting data from the various types of imagery, and (4) the cost effectiveness of remote sensing procedures for acquiring and evaluating data of the natural environment. M.G.

**N83-17957*#** Michigan State Univ., East Lansing. Center for Remote Sensing.
**DIAZO PROCESSING OF LANDSAT IMAGERY: A LOW-COST INSTRUCTIONAL TECHNIQUE**
David P. Lusch *In* Purdue Univ. CORSE-81: The 1981 Conf. on Remote Sensing Educ. 1981 p 128-136 refs ERTS (For primary document see N83-17942 08-43)
Avail: NTIS HC A16/MF A01 CSCL 05I

Diazo processing of LANDSAT imagery is a relatively simple and cost effective method of producing enhanced renditions of the visual LANDSAT products. This technique is capable of producing a variety of image enhancements which have value in a teaching laboratory environment. Additionally, with the appropriate equipment, applications research which relys on accurate and repeatable results is possible. Exposure and development equipment options, diazo materials, and enhancement routines are discussed. M.G.

**N83-17958*#** Maryland Univ., College Park. Dept. of Civil Engineering.
**UNIVERSITY/INDUSTRY COLLABORATION IN REMOTE SENSING EDUCATION**
Robert M. Ragan and J. Alan Royal (GE, Lanham, Md.) *In* Purdue Univ. CORSE-81: The 1981 Conf. on Remote Sensing Educ. 1981 p 141-145 Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS (For primary document see N83-17942 08-43)
Avail: NTIS HC A16/MF A01 CSCL 05I

A graduate level course covering the development and structure of geographical information systems and the acquisition and processing of LANDSAT data for input to these systems is described. A portion of the course was devoted to hands-on classification of LANDSAT digital tapes utilizing both university and private industry processing systems. This industry/university collaboration was extremely successful and resulted in a high quality course. It gave the students an excellent experience in working in a real-world client/consultant relationship undertaken to accomplish a specific task. There were two key factors in the success of the collaboration. First, there was a very careful product definition and advance meetings between the University faculty and the company personnel to be involved. Second, the students were not taken into the industrial facility until late in the course, after they had a reasonable knowledge of the physical bases of remote sensing, the concept of spectral signatures, and the fundamentals of pattern analysis. M.G.

**N83-17959*#** North Carolina Univ., Chapel Hill.
**THE LOCATION AND SCOPE OF GEOGRAPHIC REMOTE SENSING TRAINING IN THE UNITED STATES**
Arthur J. Hawley *In* Purdue Univ. CORSE-81: The 1981 Conf. on Remote Sensing Educ. 1981 p 161-166 refs ERTS (For primary document see N83-17942 08-43)
Avail: NTIS HC A16/MF A01 CSCL 08B

Maps displaying the distribution of graduate departments of geography in the United States and enrollments in remote sensing courses in all geography departments during the past two calendar years were compiled. It was anticipated that the two distributions would show a marked similarity since remote sensing is a relatively new geographic tool requiring specialized training to use as well as equipment not normally found in most geography departments. Thus only the larger graduate departments can afford to devote time and resources to this specialty. A broad correspondence does exist between the graduate departments of geography and the courses in remote ensing. However, the correlation is far from complete and the exceptions are frequent and large enough to cast doubt upon the accuracy of the original hypothesis. Whereas many large departments do offer courses in remote sensing, many smaller colleges and universities do also. A number of possible explanations can be offered for the discrepancies: (1) course titles, (2) the liberal arts orientation of geography departments in many universities, (3) job-oriented skills which many smaller departments have emphasized, and (4) in the tight job market many new graduates of even the larger departments have had to accept position in smaller departments and colleges. M.G.

**N83-17960*#** Vermont Univ., Burlington. Dept. of Geography.
**APPLICATIONS OF DENSITOMETRY IN REMOTE SENSING LEARNING EXPERIENCES**
Aulis Lind *In* Purdue Univ. CORSE-81: The 1981 Conf. on Remote Sensing Educ. 1981 p 169-173 refs ERTS (For primary document see N83-17942 08-43)
Avail: NTIS HC A16/MF A01 CSCL 05I

Information on the use of densitometry in remote sensing courses is provided. The use of a densitometer provides the student with a type of hands on experience in which direct manipulation of image products is involved, and the procedures are easily and quickly learned facilitating the collection and analysis of quantitative data on the radiometric properties of aerial photographs and satellite images. These data can then be used for examining relationships between image tones or colors and ground conditions. Suggestions regarding the selection of equipment and imagery are made. M.G.

**N83-17961*#** State Univ. Coll. of New York at Oneonta.
**DEVELOPING AN UNDERGRADUATE GEOGRAPHY COURSE ON DIGITAL IMAGE PROCESSING OF REMOTELY SENSED DATA**
Paul R. Baumann *In* Purdue Univ. CORSE-81: The 1981 Conf. on Remote Sensing Educ. 1981 p 174-182 ERTS (For primary document see N83-17942 08-43)
Avail: NTIS HC A16/MF A01 CSCL 05I

Problems relating to the development of a digital image processing course in an undergraduate geography environment is discussed. Computer resource requirements, course prerequisites, and the size of the study area are addressed. M.G.

**N83-17962*#** Sam Houston State Univ., Huntsville, Tex. Dept. of Geography.
**THE FIRST YEAR: DEVELOPMENT OF A LANDSAT CAPABILITY AT SAM HOUSTON STATE UNIVERSITY**
John H. Bounds *In* Purdue Univ. CORSE-81: The 1981 Conf. on Remote Sensing Educ. 1981 p 179-182 refs ERTS (For primary document see N83-17942 08-43)
Avail: NTIS HC A16/MF A01 CSCL 05I

Problems encountered in initiating a LANDSAT data processing capability at Sam Houston State University are discussed. Computer requirements, financing, and academic and administrative support are addressed. M.G.

**N83-17963*#** National Aeronautics and Space Administration. Goddard Inst. for Space Studies, New York.

**REMOTE SENSING RESEARCH IN GEOGRAPHIC EDUCATION: AN ALTERNATIVE VIEW**

Helene Wilson, Tina K. Cary, and Samuel N. Goward *In* Purdue Univ. CORSE-81: The 1981 Conf. on Remote Sensing Educ. 1981 p 183-188 refs Prepared in cooperation with Columbia Univ., New York ERTS (For primary document see N83-17942 08-43)

Avail: NTIS HC A16/MF A01 CSCL 05I

It is noted that within many geography departments remote sensing is viewed as a mere technique a student should learn in order to carry out true geographic research. This view inhibits both students and faculty from investigation of remotely sensed data as a new source of geographic knowledge that may alter our understanding of the Earth. The tendency is for geographers to accept these new data and analysis techniques from engineers and mathematicians without questioning the accompanying premises. This black-box approach hinders geographic applications of the new remotely sensed data and limits the geographer's contribution to further development of remote sensing observation systems. It is suggested that geographers contribute to the development of remote sensing through pursuit of basic research. This research can be encouraged, particularly among students, by demonstrating the links between geographic theory and remotely sensed observations, encouraging a healthy skepticism concerning the current understanding of these data. M.G.

**N83-17964*#** Fort Lewis A&M Coll., Durango, Colo. Dept. of Geology.

**USING LANDSAT IMAGERY AS A BASIS FOR THE UNDERSTANDING OF THE PHYSIOGRAPHIC REGIONS OF THE UNITED STATES**

R. W. Blair, Jr. *In* Purdue Univ. CORSE-81: The 1981 Conf. on Remote Sensing Educ. 1981 p 191-194 refs ERTS (For primary document see N83-17942 08-43)

Avail: NTIS HC A16/MF A01 CSCL 05B

An undergraduate level course in regional geology is described in which map exercises using LANDSAT composite images are required. From these exercises, students learn to appreciate LANDSAT imagery, learn elementary skills in imagery reading and interpretation, in addition to making the association of geography, geology, maps, and imagery. M.G.

**N83-17965*#** South Dakota School of Mines and Technology, Rapid City. Dept. of Geology and Geological Engineering.

**METHODS OF TRAINING THE GRADUATE LEVEL AND PROFESSIONAL GEOLOGIST IN REMOTE SENSING TECHNOLOGY**

Kenneth E. Kolm *In* Purdue Univ. CORSE-81: The 1981 Conf. on Remote Sensing Educ. 1981 p 196-203 ERTS (For primary document see N83-17942 08-43)

Avail: NTIS HC A16/MF A01 CSCL 05I

Requirements for a basic course in remote sensing to accommodate the needs of the graduate level and professional geologist are described. The course should stress the general topics of basic remote sensing theory, the theory and data types relating to different remote sensing systems, an introduction to the basic concepts of computer image processing and analysis, the characteristics of different data types, the development of methods for geological interpretations, the integration of all scales and data types of remote sensing in a given study, the integration of other data bases (geophysical and geochemical) into a remote sensing study, and geological remote sensing applications. The laboratories should stress hands on experience to reinforce the concepts and procedures presented in the lecture. The geologist should then be encouraged to pursue a second course in computer image processing and analysis of remotely sensed data. M.G.

**N83-17966*#** British Columbia Univ., Vancouver. Council on Remote Sensing.

**REMOTE SENSING EDUCATION AT THE UNIVERSITY OF BRITISH COLUMBIA**

Peter A. Murtha *In* Purdue Univ. CORSE-81: The 1981 Conf. on Remote Sensing Educ. 1981 p 207-210 refs ERTS (For primary document see N83-17942 08-43)

Avail: NTIS HC A16/MF A01 CSCL 05I

The development, current status, and organization of the University of British Columbia's interdisciplinary graduate program in remote sensing are described. Specialized programs are tailored to meet student's needs and interest and can range from the theoretical development of technology (sensor development, modelling, and computer analysis) to specialized application of remote sensing in resource analysis such as the determination of vegetation damage, land classification, and land use. The courses and faculty members are listed. A.R.H.

**N83-17967*#** Pennsylvania State Univ., University Park.

**TOWARD MULTIDISCIPLINARY USE OF LANDSAT: INTERFACING COMPUTERIZED LANDSAT ANALYSIS SYSTEMS WITH GEOGRAPHIC INFORMATION SYSTEMS**

Wayne I. Myers *In* Purdue Univ. CORSE-81: The 1981 Conf. on Remote Sensing Educ. 1981 p 212-215 (For primary document see N83-17942 08-43)

Avail: NTIS HC 16/MF A01 CSCL 05I

The LANDSAT-geographic information system (GIS) interface must summarize the results of the LANDSAT classification over the same cells that serve as geographic referencing units for the GIS, and output these summaries on a cell-by-cell basis in a form that is readable by the input routines of the GIS. The ZONAL interface for cell-oriented systems consists of two primary programs. The PIXCEL program scans the grid of cells and outputs a channel of pixels. Each pixel contains not the reflectance values but the identifier of the cell in which the center of the pixel is located. This file of pixelized cells along with the results of a pixel-by-pixel classification of the scene produced by the LANDSAT analysis system are input to the CELSUM program which then outputs a cell-by-cell summary formatted according to the requirements of the host GIS. Cross-correlation of the LANDSAT layer with the other layers in the data base is accomplished with the analysis and display facilities of the GIS. A.R.H.

**N83-17968*#** University of Northern Iowa, Cedar Falls. Dept. of Geography.

**COMMUNICATING REMOTE SENSING CONCEPTS IN AN INTERDISCIPLINARY ENVIRONMENT**

Roy Chung *In* Purdue Univ. CORSE-81: The 1981 Conf. on Remote Sensing Educ. 1981 p 217-220 refs (For primary document see N83-17942 08-43)

Avail: NTIS HC A16/MF A01 CSCL 05B

Although remote sensing is currently multidisciplinary in its applications, many of its terms come from the engineering sciences, particularly from the field of pattern recognition. Scholars from fields such as the social sciences, botany, and biology, may experience initial difficulty with remote sensing terminology, even though parallel concepts exist in their own fields. Some parallel concepts and terminologies from nonengineering fields, which might enhance the understanding of remote sensing concepts in an interdisciplinary situation are identified. Feedbacks which this analogue strategy might have on remote sensing itself are explored. A.R.H.

**N83-17969*#** Georgia Univ., Athens. Dept. of Geography.

**REMOTE SENSING EDUCATION FOR THE EARTH SCIENCES: THE UNIVERSITY OF GEORGIA EXPERIENCE**

R. Welch *In* Purdue Univ. CORSE-81: The 1981 Conf. on Remote Sensing Educ. 1981 p 222-227 (For primary document see N83-17942 08-43)

Avail: NTIS HC A16/MF A01 CSCL 05I

A prospectus is presented of the following courses offered by the Department of Geography: (1) use and interpretation of aerial photographs; (2) advanced photogrammetry; (3) remote sensing of environment; (4) geographic information systems; and (5) directed problems in the remote sensing of the environment. In addition to the course content and objectives, the various equipments available for student training and use are listed. A.R.H.

**N83-17970*#** Kansas Univ., Lawrence. Dept. of Geography-Meteorology.
**LOW-COST DIGITAL IMAGE PROCESSING ON A UNIVERSITY MAINFRAME COMPUTER**
T. H. Lee Williams *In* Purdue Univ. CORSE-81: The 1981 Conf. on Remote Sensing Educ. 1981 p 231-236 refs (For primary document see N83-17942 08-43)
Avail: NTIS HC A16/MF A01 CSCL 05B

The advantages and limitations of using university mainframe computers in digital image processing instruction are listed. Aspects to be considered when designing software for this purpose include not only two general audience, but also the capabilities of the system regarding the size of the image/subimage, preprocessing and enhancement functions, geometric correction and registration techniques; classification strategy, classification algorithm, multitemporal analysis, and ancilliary data and geographic information systems. The user/software/hardware interaction as well as acquisition and operating costs must also be considered. A.R.H.

**N83-17971*#** Santa Clara Univ., Calif. Dept. of Electrical Engineering and Computer Science.
**DIGITAL IMAGE PROCESSING ON A SMALL COMPUTER SYSTEM**
Ronald Danielson *In* Purdue Univ. CORSE-81: The 1981 Conf. on Remote Sensing Educ. 1981 p 239-242 refs (For primary document see N83-17942 08-43)
Avail: NTIS HC A16/MF A01 CSCL 09B

A minicomputer-based image processing facility provides a relatively low-cost entry point for education about image analysis applications in remote sensing. While a minicomputer has sufficient processing power to produce results quite rapidly for low volumes of small images, it does not have sufficient power to perform CPU- or 1/0-bound tasks on large images. A system equipped with a display terminal is ideally suited for interactive tasks. Software procurement is a limiting factor for most end users, and software availability may well be the overriding consideration in selecting a particular hardware configuration. The hardware chosen should be selected to be compatible with the software and with concern for future expansion. A.R.H.

**N83-17972*#** State Univ. of New York, Albany. Dept. of Geography.
**CONSIDERATIONS IN DEVELOPING GEOGRAPHIC INFORMATIONS SYSTEMS BASED ON LOW-COST DIGITAL IMAGE PROCESSING**
Floyd M. Henderson and Michael W. Dobson *In* Purdue Univ. CORSE-81: The 1981 Conf. on Remote Sensing Educ. 1981 p 243-246 (For primary document see N83-17942 08-43)
Avail: NTIS HC A16/MF A01 CSCL 05B

The potential of digital image processing systems costing $20,000 or less for geographic information systems is assessed with the emphasis on the volume of data to be handled, the commercial hardware systems available, and the basic software for: (1) data entry, conversion and digitization; (2) georeferencing and geometric correction; (3) data structuring; (4) editing and updating; (5) analysis and retrieval; (6) output drivers; and (7) data management. Costs must also be considered as tangible and intangible factors. A.R.H.

**N83-17973*#** Kansas Univ., Lawrence. Dept. of Geography-Meteorology.
**INSTRUCTIONAL IMAGE PROCESSING ON A UNIVERSITY MAINFRAME: THE KANSAS SYSTEM**
T. H. Lee Williams, Jeffrey Siebert, and Christopher Gunn *In* Purdue Univ. CORSE-81: The 1981 Conf. on Remote Sensing Educ. 1981 p 249-252 refs (For primary document see N83-17942 08-43)
Avail: NTIS HC A16/MF A01 CSCL 05I

An interactive digital image processing program package was developed that runs on the University of Kansas central computer, a Honeywell Level 66 multi-processor system. The module form of the package allows easy and rapid upgrades and extensions of the system and is used in remote sensing courses in the Department of Geography, in regional five-day short courses for academics and professionals, and also in remote sensing projects and research. The package comprises three self-contained modules of processing functions: Subimage extraction and rectification; image enhancement, preprocessing and data reduction; and classification. Its use in a typical course setting is described. Availability and costs are considered. A.R.H.

**N83-17974*#** Georgia Univ., Athens. Dept. of Geography.
**IMAGES: AN INTERACTIVE IMAGE PROCESSING SYSTEM**
John R. Jensen *In* Purdue Univ. CORSE-81: The 1981 Conf. on Remote Sensing Educ. 1981 p 254-257 refs (For primary document see N83-17942 08-43)
Avail: NTIS HC A16/MF A01 CSCL 09B

The IMAGES interactive image processing system was created specifically for undergraduate remote sensing education in geography. The system is interactive, relatively inexpensive to operate, almost hardware independent, and responsive to numerous users at one time in a time-sharing mode. Most important, it provides a medium whereby theoretical remote sensing principles discussed in lecture may be reinforced in laboratory as students perform computer-assisted image processing. In addition to its use in academic and short course environments, the system has also been used extensively to conduct basic image processing research. The flow of information through the system is discussed including an overview of the programs. A.R.H.

**N83-17975*#** South Carolina Univ., Columbia. Dept. of Geography.
**DIGITAL IMAGE DATA SETS FOR REMOTE SENSING INSTRUCTION**
J. Ronald Eyton *In* Purdue Univ. CORSE-81: The 1981 Conf. on Remote Sensing Educ. 1981 p 259-262 refs (For primary document see N83-17942 08-43)
Avail: NTIS HC A16/MF A01 CSCL 09B

Several sets of LANDSAT image segments and a set of simple image processing programs operating in batch mode are being used to teach an introductory course in digital image analysis and classification. The image data sets contain only a small number of pixels and can be run quickly on most university computing systems. A number of image data sets derived from the raw spectral bands (smoothed data sets, band ratios and texture data sets) allows the student to examine and include these extracted variables in the classification process. Another data set consists of three registered LANDSAT image segments for three different dates so that the student may experiment with multitemporal data processing. The three LANDSAT scenes used in the class are described and the image data sets available for class exercises are listed. Author

**N83-17976*#** Pennsylvania State Univ., University Park. Office for Remote Sensing of Earth Resources.
**SOME CONSIDERATIONS IN LOW-COST IMAGE PROCESSING ON A UNIVERSITY MAIN FRAME: THE PENN STATE (ORSER) EXPERIENCE**
Brian J. Turner *In* Purdue Univ. CORSE-81: The 1981 Conf. on Remote Sensing Educ. 1981 p 264-267 refs (For primary document see N83-17942 08-43)
Avail: NTIS HC A16/MF A01 CSCL 05I

The ORSER System as implemented on the Penn State University Computation Center's IBM main frame is an exceptionally useful mechanism for instructing the present and future remote sensing community in the theory and practice of automated analysis of digitized data. From its beginning, the system was used as the hands-on back-bone of a graduate level 'Multispectral Remote Sensing' one-term course taught annually in the School of Forest Resources. It was also used at the end of a senior-level undergraduate 'Introduction to Remote Sensing' course, and in teaching a variety of short courses, ranging in length from a few days for small groups of remote sensing consultants with specific application interests, to a 2-week course oganized by NASA for regional and urban planners who had little or no previus exposure to remote sensing. Because of its modular construction, the ORSER is

suitable for all classes of remote sensing users. Although in a beginning course only 6 to 10 of the programs are generally used, the researcher has a set of about 35 programs available for his analyses. A.R.H.

**N83-17977*#** Environmental Research Inst. of Michigan, Ann Arbor.
**THE REMOTE ANALYSIS STATION (RAS) AS AN INSTRUCTIONAL SYSTEM**
Robert H. Rogers, Charles L. Wilson, Robert H. Dye, and Eugene Jaworski (Univ. of Eastern Michigan, Ypsilanti) *In* Purdue Univ. CORSE-81: The 1981 Conf. on Remote Sensing Educ. 1981 p 269-275 (For primary document see N83-17942 08-43)
Avail: NTIS HC A16/MF A01 CSCL 05I

'Hands-on' training in LANDSAT data analysis techniques can be obtained using a desk-top, interactive remote analysis station (RAS) which consists of a color CRT imagery display, with alphanumeric overwrite and keyboard, as well as a cursor controller and modem. This portable station can communicate via modem and dial-up telephone with a host computer at 1200 baud or it can be hardwired to a host computer at 9600 baud. A Z80 microcomputer controls the display refresh memory and remote station processing. LANDSAT data is displayed as three-band false-color imagery, one-band color-sliced imagery, or color-coded processed imagery. Although the display memory routinely operates at 256 x 256 picture elements, a display resolution of 128 x 128 can be selected to fill the display faster. In the false color mode the computer packs the data into one 8-bit character. When the host is not sending pictorial information the characters sent are in ordinary ASCII code. System capabilities are described. A.R.H.

**N83-17978*#** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md. Geosciences Systems Dept.
**APPLE IMAGE PROCESSING EDUCATOR**
Fred J. Gunther *In* Purdue Univ. CORSE-81: The 1981 Conf. on Remote Sensing Educ. 1981 p 277-281 (For primary document see N83-17942 08-43)
Avail: NTIS HC A16/MF A01 CSCL 09B

A software system design is proposed and demonstrated with pilot-project software. The system permits the Apple II microcomputer to be used for personalized computer-assisted instruction in the digital image processing of LANDSAT images. The programs provide data input, menu selection, graphic and hard-copy displays, and both general and detailed instructions. The pilot-project results are considered to be successful indicators of the capabilities and limits of microcomputers for digital image processing education. Author

**N83-17979*#** Egbert Scientific Software, Greenport, N.Y.
**INTERACTIVE CAPABILITIES: BETWEEN UNACCEPTABLE AND UNNECESSARY**
Dwight D. Egbert *In* Purdue Univ. CORSE-81: The 1981 Conf. on Remote Sensing Educ. 1981 p 285-290 (For primary document see N83-17942 08-43)
Avail: NTIS HC A16/MF A01 CSCL 09B

A very low cost interactive image analysis computer system suitable for use in education, research, or operational remote sensing applications system should be centered around a high quality image display through which the analyst can use photointerpretation skills to evaluate and alter computer mapping or classification calculations. The definition of acceptable capabilities for such a system must take into account the needs of the image analyst balanced with current state-of-the-art technology and cost. A range of acceptable capabilities is defined based primarily on image analysis requirements, but tempered occassionally by cost and technology constraints. Desirable parameters are also listed. A.R.H.

**N83-17980*#** Santa Clara Univ., Calif. Dept. of Electrical Engineering and Computer Science.
**SELECTING AN IMAGE ANALYSIS MINICOMPUTER SYSTEM**
Ronald Danielson *In* purdue Univ. CORSE-81: The 1981 Conf. on Remote Sensing Educ. 1981 p 293-296 (For primary document see N83-17942 08-43)
Avail: NTIS HC A16/MF A01 CSCL 09B

Factors to be weighed when selecting a minicomputer system as the basis for an image analysis computer facility vary depending on whether the user organization procures a new computer or selects an existing facility to serve as an image analysis host. Some conditions not directly related to hardware or software should be considered such as the flexibility of the computer center staff, their encouragement of innovation, and the availability of the host processor to a broad spectrum of potential user organizations. Particular attention must be given to: image analysis software capability; the facilities of a potential host installation; the central processing unit; the operating system and languages; main memory; disk storage; tape drives; hardcopy output; and other peripherals. The operational environment, accessibility; resource limitations; and operational supports are important. Charges made for program execution and data storage must also be examined. A.R.H.

**N83-17981*#** Murray State Univ., Ky. Mid-America Remote Sensing Center.
**THE EARTH RESOURCES LABORATORY APPLICATIONS SOFTWARE (ELAS) IN UNIVERSITY RESEARCH AND EDUCATION: AN OPERATOR ORIENTED GEOBASED INFORMATION SYSTEM**
B. L. Coker, T. C. Kind, W. F. Smith, Jr., and N. V. Weber *In* Purdue Univ. CORSE-81: The 1981 Conf. on Remote Sensing Educ. 1981 p 298-303 (For primary document see N83-17942 08-43)
Avail: NTIS HC A16/MF A01 CSCL 09B

Created for analyzing and processing digital data such as that collected by multispectral scanners or digitized from maps, ELAS is designed for ease of user operation and includes its own FORTRAN operating monitor and an expandable set of application modules which are FORTRAN overlays. On those machines that do not support FORTRAN overlaying, the modules exist as subprograms. The subsystem can be implemented on most 16-bit or 32-bit machines and is capable of, but not limited to, operating on low-cost minicomputer systems. The recommended hardware configuration for ELAS and a representative listing of some operating and application modules are presented. A.R.H.

**N83-17982*#** Georgia Inst. of Tech., Atlanta.
**DEVELOPMENT AND IMPLEMENTATION OF A LOW COST MICRO COMPUTER SYSTEM FOR LANDSAT ANALYSIS AND GEOGRAPHIC DATA BASE APPLICATIONS**
Nicholas Faust and Lawrie Jordon (ERDAS, Atlanta, Ga.) *In* Purdue Univ. CORSE-81: The 1981 Conf. on Remote Sensing Educ. 1981 p 309-314 (For primary document see N83-17942 08-43)
Avail: NTIS HC A16/MF A01 CSCL 09B

Since the implementation of the GRID and IMGRID computer programs for multivariate spatial analysis in the early 1970's, geographic data analysis subsequently moved from large computers to minicomputers and now to microcomputers with radical reduction in the costs associated with planning analyses. Programs designed to process LANDSAT data to be used as one element in a geographic data base were used once NIMGRID (new IMGRID), a raster oriented geographic information system, was implemented on the microcomputer. Programs for training field selection, supervised and unsupervised classification, and image enhancement were added. Enhancements to the color graphics capabilities of the microsystem allow display of three channels of LANDSAT data in color infrared format. The basic microcomputer hardware needed to perform NIMGRID and most LANDSAT analyses is listed as well as the software available for LANDSAT processing. A.R.H.

**N83-17983*#** National Aeronautics and Space Administration, Washington, D. C.
**REMOTE SENSING EDUCATION IN NASA'S TECHNOLOGY TRANSFER PROGRAM**
Richard H. Weinstein *In* Purdue Univ. CORSE-81: The 1981 Conf. on Remote Sensing Educ. 1981 p 316-319 (For primary

document see N83-17942 08-43)
Avail: NTIS HC A16/MF A01 CSCL 05B

Remote sensing is a principal focus of NASA's technology transfer program activity with major attention to remote sensing education the Regional Program and the University Applications Program. Relevant activities over the past five years are reviewed and perspective on future directions is presented. A.R.H.

**N83-17984*#** Massachusetts Univ., Amherst. Dept. of Forestry and Wildlife Management.
**DEVELOPMENT OF THE UNIVERSITY OF MASSACHUSETTS REMOTE SENSING PROGRAM: A GRASS-ROOTS APPROACH**
Kevin Richardson *In* Purdue Univ. CORSE-81: The 1981 Conf. on Remote Sensing Educ. 1981 p 321-324 (For primary document see N83-17942 08-43)
Avail: NTIS HC A16/MF A01 CSCL 05I

The early stages of development of a remote sensing center at a state land grant university are considered. Several critical strategies adopted early in the planning process which may be useful to other programs or institutions are described. A.R.H.

**N83-17985*#** Kansas Univ., Lawrence. Space Technology Center.
**THE UNIVERSITY OF KANSAS APPLIED SENSING PROGRAM: AN OPERATIONAL PERSPECTIVE**
Edward A. Martinko *In* Purdue Univ. CORSE-81: The 1981 Conf. on Remote Sensing Educ. 1981 p 325-327 (For primary document see N83-17942 08-43)
Avail: NTIS HC A16/MF A01 CSCL 05I

The Kansas applied remote sensing (KARS) program conducts demonstration projects and applied research on remote sensing techniques which enable local, regional, state and federal agency personnel to better utilize available satellite and airborne remote sensing systems. As liason with Kansas agencies for the Earth Resources Laboratory (ERL), Kansas demonstration project, KARS coordinated interagency communication, field data collection, hands-on training, and follow-on technical assistance and worked with Kansas agency personnel in evaluating land cover maps provided by ERL. Short courses are being conducted to provide training in state-of-the-art remote sensing technology for university faculty, state personnel, and persons from private industry and federal government. Topics are listed which were considered in intensive five-day courses covering the acquisition, interpretation, and application of information derived through remote sensing with specific training and hands-on experience in image interpretation and the analysis of LANDSAT data are listed. A.R.H.

**N83-17986*#** Oregon State Univ., Corvallis. Environmental Remote Sensing Applications Lab.
**OREGON TRAILS REVISTED**
Anthony J. Lewis, Cassandra J. Alexander, Madeline J. Hall, Dennis L. Isaacson, Ray J. Murray, and Barry J. Schrumpf *In* Purdue Univ. CORSE-81: The 1981 Conf. on Remote Sensing Educ. 1981 p 328-335 (For primary document see N83-17942 08-43)
Avail: NTIS HC A16/MF A01 CSCL 13B

Oregon State University's Environmental Remote Sensing Applications Laboratory (ERSAL) has six full-time researchers with expertise in a variety of biological, Earth, atmospheric and computer sciences as well as image interpretation and statistical techniques. The primary emphasis of the ERSAL research and demonstration program is the development and application of remote sensing technology in operational resource management programs. LANDSAT multi-spectral, multi-date digital data and imagery are utilized in concert with high altitude NASA-acquired photography, low altitude ERSAL-acquired photography, and field observations and data to provide customized, inexpensive and useful final products. Synopses are given of 9 applications projects conducted in Oregon. A.R.H.

**N83-17987*#** California Univ., Santa Barbara. Dept. of Geography.
**SOURCES OF SUPPORT FOR REMOTE SENSING EDUCATION**
John E. Estes *In* Purdue Univ. CORSE-81: The 1981 Conf. on Remote Sensing Educ. 1981 p 336-339 (For primary document see N83-17942 08-43)
Avail: NTIS HC A16/MF A01 CSCL 05I

Past financial support for educational programs in remote sensing came largely in the form of short courses funded by the National Science Foundation. Later NASA began to fund such courses for local and state government and for some university participants in its regional programs. The greater impact came from the funding by a variety of federal agencies for remote sensing research projects at educational institutions throughout the country. Probably the best and most significant example of these programs, from the university standpoint is, and should continue to be, the NASA university affairs programs, which with its long term step funding of a number of institutions has probably done more for remote sensing education than any other federal program in this country. An incomplete listing of federal agencies that support remote sensing research at the university level is presented. A.R.H.

**N83-17988*#** National Aeronautics and Space Administration, Washington, D. C.
**STATUS AND OUTLOOK FOR NASA'S LAND REMOTE SENSING PROGRAM**
Richard H. Weinstein *In* Purdue Univ. CORSE-81: The 1981 Conf. on Remote Sensing Educ. 1981 p 341-342 (For primary document see N83-17942 08-43)
Avail: NTIS HC A16/MF A01 CSCL 05A

Both LANDSAT 2 and LANDSAT 3 are currently in operational status following recovery from technical problems. The LANDSAT D program continues NASA's R&D with the dual objectives of assessing the capabilities of the thematic mapper sensor and evaluating the requirements for an operational land observing system. LANDSAT D' will not be launched until LANDSAT D ceases operation, to provide data continuity through 1988. Future NASA remote sensing programs will continue to emphasize research, technology development, cooperative projects with end users of data and cooperation with the National Oceanic and Atmospheric Administration (NOAA) on transition to an operational land observing system. Technology development should extend the results of research to practical applications through improved ground data processing and information extraction techniques and development of new sensors such as the solid state multi-spectral linear array. A.R.H.

**N83-17989*#** National Oceanic and Atmospheric Administration, Washington, D. C. National Earth Satellite Service.
**THE OUTLOOK FOR THE NOAA OPERATIONAL LANDSAT PROGRAM**
Harold W. Yates *In* Purdue Univ. CORSE-81: The 1981 Conf. on Remote Sensing Educ. 1981 p 343-346 (For primary document see N83-17942 08-43)
Avail: NTIS HC A16/MF A01 CSCL 05A

The impact of the current federal budget on the establishment of an operational LANDSAT system is examined with particular emphasis on NOAA responsibilities and efforts to transfer operation of the land satellite system to the private sector. In order to recover the cost of maintenance and operations, the price of system data and products must be raised. Cooperative efforts needed for NASA, EDC, and NOAA to implement the operational system are discussed. A.R.H.

**N83-17990*#** OAO Corp., Greenbelt, Md.
**EVALUATION OF THE USER REQUIREMENTS PROCESSES FOR NASA TERRESTRIAL APPLICATIONS PROGRAMS**
31 Jan. 1982 87 p ERTS
(Contract NASw-3358)
(E83-10180; NASA-CR-169835; NAS 1.26:169835) Avail: NTIS HC A05/MF A01 CSCL 05B

To support the evolution of increasingly sound user requirements definition processes that would meet the broad range of NASA's terrestrial applications planning and management needs during the 1980's, the user requirements processes as they function in the real world at the senior and middle management levels

were evaluated. Special attention was given to geologic mapping and domestic crop reporting to provide insight into problems associated with the development and management of user established conventional practices and data sources. An attempt was made to identify alternative NASA user interfaces that sustain strengths, alleviate weaknesses, maximize application to multiple problems, and simplify management cognizance. Some of the alternatives are outlined and evaluated. It is recommended that NASA have an identified organizational point of focus for consolidation and oversight of the user processes. A.R.H.

**N83-17991*#** OAO Corp., Greenbelt, Md.
**ANALYSIS OF THE PRIVATE MARKET FOR LANDSAT PRODUCTS AND APPLICATIONS Final Report**
31 Mar. 1981 131 p ERTS
(Contract NASw-3358)
(E83-10181; NASA-CR-169836; NAS 1.26:169836; OAO/TR-81/0023) Avail: NTIS HC A07/MF A01 CSCL 05B

The private sector was examined and evaluated to develop base line strategies and mechanisms for its increased utilization of LANDSAT (and future satellite) technologies as both consumer and producer of products and services. Methodologies used to assess the digital analysis service and national mapping industries are described. Private sector users in business and industry are identified and the potential U.S. industry role in the foreign LANDSAT market is considered. A.R.H.

**N83-17992*#** Jet Propulsion Lab., California Inst. of Tech., Pasadena.
**PRECIPITABLE WATER: ITS LINEAR RETRIEVAL USING LEAPS AND BOUNDS PROCEDURE AND ITS GLOBAL DISTRIBUTION FROM SEASAT SMMR DATA**
Prem Chand Pandey (Space Applications Centre, Ahmedabad, India) 1 Dec. 1982 29 p refs Sponsored by NASA ERTS
(E83-10182; NASA-CR-169786; JPL-Pub-82-96; NAS 1.26:169786) Avail: NTIS HC A03/MF A01 CSCL 04B

Eight subsets using two to five frequencies of the SEASAT scanning multichannel microwave radiometer are examined to determine their potential in the retrieval of atmospheric water vapor content. Analysis indicates that the information concerning the 18 and 21 GHz channels are optimum for water vapor retrieval. A comparison with radiosonde observations gave an rms accuracy of approximately 0.40 g sq cm. The rms accuracy of precipitable water using different subsets was within 10 percent. Global maps of precipitable water over oceans using two and five channel retrieval (average of two and five channel retrieval) are given. Study of these maps reveals the possibility of global moisture distribution associated with oceanic currents and large scale general circulation in the atmosphere. A stable feature of the large scale circulation is noticed. The precipitable water is maximum over the Bay of Bengal and in the North Pacific over the Kuroshio current and shows a general latitudinal pattern. A.R.H.

**N83-17993*#** North Carolina State Univ., Raleigh. Dept. of Marine, Earth, and Atmospheric Sciences.
**CRUSTAL INTERPRETATION OF THE MAGSAT DATA IN THE CONTINENTAL UNITED STATES Final Report**
I. J. Won and K. H. Son Dec. 1982 35 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS
(Contract NAS5-26157)
(E83-10183; NASA-CR-169837; NAS 1.26:169837) Avail: NTIS HC A03/MF A01 CSCL 08G

The processing of MAGSAT scalar data to construct a crustal magnetic anomaly map over the continental U.S. involves removal of the reference field model, a path-by-path subtraction of a low order polynomial through a least-squares fit to reduce orbital offset errors, and a two dimensional spectral filtering to mitigate the spectral bias induced by the path-by-path orbital correction scheme. The resultant anomaly map shows reasonably good correlations with an aeromagnetic map derived from the project MAGNET. Prominent satellite magnetic anomalies are identified in terms of geological provinces and age boundaries. An inversion method was applied to MAGSAT data which produces both the Curie depth topography and laterally varying magnetic susceptibility of the crust. A contoured Curie depth map thus derived shows general agreements with a crustal thickness map based on seismic data. A.R.H.

**N83-17994*#** Technicolor Graphic Services, Inc., Sioux Falls, S. Dak.
**AN INVESTIGATION OF MAGSAT AND COMPLEMENTARY DATA EMPHASIZING PRECAMBRIAN SHIELDS AND ADJACENT AREAS OF WEST AFRICA AND SOUTH AMERICA Quarterly Report, 1 Oct. - 31 Dec. 1982**
David A. Hastings, Principal Investigator 31 Dec. 1982 6 p Sponsored by NASA ERTS
(Contract DI-14-08-0001-20129)
(E83-10184; NASA-CR-169838; NAS 1.26:169838) Avail: NTIS HC A02/MF A01 CSCL 08B

Some MAGSAT data and preliminary results emphasizing Africa, Latin America, and the Caribbean were presented to geologists in Jamaica, Guyana, Brazil, and Argentina who then expressed interest in collaborating on linking computer modeling of MAGSAT data to tectonic and metallogenic interpretation for South America and in making the final interpretation. Modeling continues with the preparation of a synopsis tectonic map of South America and the initiation of semi-final modeling of northern South America. A.R.H.

**N83-17995*#** National Aeronautics and Space Administration, Washington, D. C.
**LANDSAT-4 POST LAUNCH REPORT 1**
19 Jul. 1982 2 p ERTS
(E83-10185; NASA-TM-85218; E-668-82-01; NAS 1.15:85218) Avail: NTIS HC A02/MF A01 CSCL 22B

LANDSAT-4 (formerly LANDSAT-D) was launched successfully at 1:59 p.m. EDT on July 16, 1982, from Vandenberg Air Force Base. The Delta 3920 launch vehicle performed flawlessly and placed the satellite into the planned three sigma low orbit of 694 km. The lower orbit was selected to eliminate a retrograde maneuver for the orbit adjust burns necessary to place the satellite into its planned operational 16-day repeat track at 705 km. Spacecraft separation and the initiation of solar array depolyment occurred, over the Indian Ocean tracking station. Spacecraft attitude rates at separation were low, allowing the Earth sensor to immediately acquire the Earth with the momentum wheels and without use of the propulsion system. All systems activated as of noon on July 18, 1982, are performing well with no significant discrepancies reported. A.R.H.

**N83-17996*#** Earth Satellite Corp., Washington, D. C.
**STUDY OF LANDSAT-D THEMATIC MAPPER PERFORMANCE AS APPLIED TO HYDROCARBON EXPLORATION Quarterly Progress Report, 7 Oct. 1982 - 7 Jan. 1983**
7 Jan. 1983 5 p ERTS
(Contract NAS5-27384)
(E83-10186; NASA-CR-169840; NAS 1.26:169840; QPR-1) Avail: NTIS HC A02/MF A01 CSCL 08B

Analysis of the tapes of the Detroit, Michigan scene, which were received in fully processed format with geometric and radiometric correction, shows evidence of an along line data slip every sixteenth line in TM channel 2. Very large scale products were therefore generated in false color using channels 1, 3, and 4. Subjective evaluation of these enhanced scenes indicates that they are acceptable for interpretation at scales up to 1:50,000 and should be useful for change mapping probably up to 1:24,000 scale. The significant striping visible in water bodies for both the natural color and false color products indicates that the detector calibration is probably performing below the preflight specification. Variance-covariance matrices were computed and principal component analysis were performed for a set of 512 x 512 windows within the Arkansas scene. Initial analysis shows the shortwave infrared channels (TM 5 and 6) are a highly significant data source. The thermal channel (TM 7) shows negative correlation with TM 1 through 4. A.R.H.

**N83-17997*#** Lunar and Planetary Inst., Houston, Tex.
**PROCESSING MAGSAT DATA FOR COMPARISON WITH GEOID ANOMALIES Final Report**
C. O. Bowin, Principal Investigator [1982] 6 p refs ERTS (Contract NASw-3389)
(E83-10187; NASA-CR-169841; NAS 1.26:169841) Avail: NTIS HC A02/MF A01 CSCL 05B

A digital data library of MAGSAT data consisting of 1,615,636 measurements from the quiet data set, is geographically sorted, and allows rapid analysis and processing of all the quiet magnetic data about any selected location. Because this library of MAGSAT data is compatible with existing gravity and geoid data library processing and display system software, correlations between MAGSAT, surface gravity, GEOS-3 radar altimeter geoid and bathymetric data sets can be conveniently detected and analyzed. Polynomial trends from each half-orbit were removed as an effective way of estimating and removing ring current effects following estimation of the core field contribution. It was found that a third order polynomial is the lowest polynomial order that appears to provide the best consistency of residual anomalies between coincident orbits. A.R.H.

**N83-17998*#** California Univ., Los Angeles. Inst. of Geophysics and Planetary Physics.
**DATA REDUCTION AND ANALYSIS OF ISEE MAGNETOMETER EXPERIMENT Report, 1 Jul. - 30 Sep. 1982**
C. T. Russell Sep. 1982 9 p refs
(Contract NAS5-25772)
(NASA-CR-169849; NAS 1.26:169849) Avail: NTIS HC A02/MF A01 CSCL 05B

The ISEE-1 and -2 magnetometer data was reduced. The up and downstream turbulence associated with interplanetary shocks were studied, including methods of determining shock normals, and the similarities and differences in laminar and quasi-laminar shock structure. The associated up and downstream turbulence was emphasized. The distributions of flux transfer events, field aligned currents in the near tail, and substorm dynamics in the magnetotail were also investigated. Author

**N83-17999#** Research Inst. of National Defence, Stockholm (Sweden).
**THE IMPORTANCE OF SATISFACTORY POSITIONING, DIVING AND MAPPING SYSTEMS, SUITABLE FOR EXPLORATION AND TRANSPORTATION IN ICE-COVERED SEA AREAS**
Ragnar Thoren 1982 66 p refs Presented at Intern. Soc. for Photogrammetry and Remote Sensing (ISPRS) Intern. Symp., Toulouse, 13-17 Sep. 1982
(FOA-B-60003-M7) Avail: NTIS HC A04/MF A01

The evolution of remote sensing for operations in ice-covered sea areas, especially in the exploration of natural resources, such as oil, gas and minerals, and at surface shipping as well as under-ice navigation is reviewed. Expeditions and interdisciplinary scientific projects of special value for arctic operations are described. Underwater pingoes, offshore permafrost and ground ice are discussed. Hydrooptics, hydroacoustics and navigation FOA-SUB (remote-controlled research vehicle), and diving activities and underwater communication are considered. Offshore activities and Scandinavian underwater technology are examined. A remotely-piloted vehicle employed for ship wreck reconnaissance in the High Arctic is described. Author

**N83-18000#** National Aerospace Lab., Amsterdam (Netherlands). Flight and Informatics Div.
**PROCESSING AND INTERPRETATION OF LANDSAT MSS DATA OF TEST AREAS IN FLEVOLAND AND FRIESLAND**
W. Verhoef, H. A. vanIngenSchenau, N. J. J. Bunnik, and H. W. J. vanKasten (Center for Agrobiological Research Cabo) 30 Oct. 1981 62 p refs Original contains color illustrations
(NLR-TR-81108-U) Avail: NTIS HC A04/MF A01

The image processing methods used on LANDSAT multispectral data for classification of agricultural areas in Southern Flevoland and Eastern Flevoland and for investigation of the soil moisture in the southern area of Friesland are described. The results of the classification are analyzed by the crop maps of the agricultural areas. The soil moisture investigation was based on contrast enhanced images and their correlation with the grassland survey map and soil map. E.A.K.

**N83-18001#** National Aerospace Lab., Amsterdam (Netherlands). Flight Div.
**INFLUENCE OF CROP GEOMETRY ON MULTISPECTRAL REFLECTANCE DETERMINED BY THE USE OF CANOPY REFLECTANCE MODELS**
W. Verhoef and N. J. J. Bunnik 14 Jul. 1981 21 p refs Presented at Intern. Colloq. on Spectral Signatures of Objects in Remote Sensing, Avignon, France, 8-11 Sep. 1981 Previously announced in AIAA as A82-45422
(NLR-MP-81042-U) Avail: NTIS HC A02/MF A01

Descriptions of canopy geometry and on different models for predicting canopy reflectance are reviewed. The influence of canopy geometry on the reflectance of incident radiation by agricultural crops and natural vegetation is of vital importance for proper processing and interpretation of multispectral image data acquired by earth resources satellites and aircraft. Some models are applied to study the nonLambertian character of canopy reflectance for various crop geometries and provide the keys to a more quantitative interpretation of multispectral images of vegetated areas. A new model the SAIL, is applied to generate examples of the relations which are studied by canopy reflectance modelling. E.A.K.

**N83-18002#** National Aerospace Lab., Amsterdam (Netherlands). Flight Div.
**PREPROCESSING OF AIRBORNE REMOTE SENSING DATA. PART 2: NEW DEVELOPMENTS**
P. Binnenkade Feb. 1981 10 p refs Presented at Remote Sensing Soc. Conf. on Matching Remote Sensing Technol. and Their Appl., London, 16-18 Dec. 1981
(NLR-MP-81060-U) Avail: NTIS HC A02/MF A07

A number of sensor systems operated from airborne platforms are described. Thus far it was not possible to correct the acquired imagery for platform motion and position. a multidisciplinary team shows the affects of the combination of aircraft data with SLAR imagery to obtain geometrically and radiometrically corrected data for further use defined processing and interpretation. E.A.K.

**N83-18003#** Technische Univ., Vienna (Austria). Inst. fuer Photogrammetrie.
**ESTIMATION OF ACCURACY FOR DIGITAL ELEVATION MODELS BASED ON SPECTRAL ANALYSIS Ph.D. Thesis [GENAUIGKEITSSCHAETZUNG DIGITALER HOEHENMODELLE MITTELS SPEKTRALANALYSE]**
K. Tempfli May 1982 131 p refs In GERMAN; ENGLISH summary
(Geowiss-Mitt-22-1982) Avail: NTIS HC A07/MF A01

A digital elevation model which represents a topographic or other surface and includes a rule for regaining a continuous description of the surface is discussed. Accuracy assessment is based on spectral analysis. The influence of sampling density and the method of reconstruction on the accuracy of the digital elevation model is characterized by the transfer function; the surface and the measuring error properties are described by the respective amplitude spectra. The derived estimation formulas are applied to artificial, computer generated data. By varying all influencing factors, an empirical evaluation and demonstration of the procedure is obtained. The accuracy of a digital elevation model essentially depends on the size of the sampling interal in relation to the variability of the surface. It is indicated that profile analyses allow estimation of the accuracy of the surface representation. Application of the estimation procedure for planning purposes and evaluation products derived from the digital elevation model is outlined. The spectral approach determines other measurements for the quality of a digital elevation model. E.A.K.

**N83-18004#** Research Inst. of National Defence, Linkoeping (Sweden). Dept. 3.

**CREATION OF A ROAD DATABASE FROM MAP OVERLAYS**
Lennart Olsson, Jan-Olof Eklundh, and Sten Nyberg Sep. 1982 37 p refs In ENGLISH; SWEDISH summary
(FOA-C-30295-E1) Avail: NTIS HC A03/MF A01

This study concerns the development and implementation of programs which search an image file consisting of roads, houses and borders. The roads in the image are detected, classified and tracked. Output from the programs are road segments and their corresponding polygons. Author

**N83-18005#** Pacific Northwest Lab., Richland, Wash.
**DESIGN OF HIGHWALL MINING EQUIPMENT ELECTRONIC GUIDANCE PACKAGE**
B. B. Brenden, G. P. Morgen, and J. R. Skorpik Nov. 1981 148 p
(Contract DE-AC06-76RL-01830)
(DE82-006115; PNL-4004) Avail: NTIS HC A07/MF A01

Design specifics and guidance software are presented for a guidance system intended for use in guiding an auger type highwall mining head through thin coal seams to depths of up to 600 ft. A small desk top computer is used at the operator's station to send and receive signals in serialized bit streams to a downhole microprocessor. The guidance system accepts signals from a variety of sensors and uses these signals to plot and control the course of the auger head automatically using computer algorithms designed to keep the auger head in the coal seam and maintain a specified stump thickness. DOE

**N83-18006#** Los Alamos Scientific Lab., N. Mex.
**A COMPARISON OF TWO COMMON METHODS OF SURFACE-TOPOGRAPHY EVALUATION**
Allen Gauler 1981 50 p Presented at the Conf. on Conical Opt. Elem. Metrology, Albuquerque, N. Mex., 24-25 Jun. 1981
(Contract W-7405-eng-36)
(DE82-002372; LA-UR-81-3070; CONF-8106166-1) Avail: NTIS HC A03/MF A01

Some of the advantages and limitations of two methods used for surface topography evaluation, the dual beam interference microscope and the stylus type profiling instrument, are compared. Consideration is primarily limited to diamond machined or other high quality surfaces, such as are commonly encountered on optical elements. Parameters discussed include horizontal and vertical resolution, horizontal and vertical range, and surface damage. DOE

**N83-18007#** New York State Energy Research and Development Authority, New York.
**PEAT-RESOURCE ESTIMATION IN NEW YORK STATE Quarterly Report, 1 Jul. - 31 Oct. 1981**
Jeffrey M. Peterson Dec. 1981 12 p Sponsored in part by Gas Research Inst.
(Contract DE-FG01-81FE-05110)
(DE82-005156; DOE/FE-05110-T2; QR-2) Avail: NTIS HC A02/MF A01

This report discusses progress made on the New York State peat inventory project as of October 1981. The principal objective is to determine the energy potential and distribution of peat resources in New York. The collection of existing data, identification of protected land, and standardization of mapping methods were addressed during this first year. DOE

**N83-18008#** Department of Energy, Laramie, Wyo.
**SIMULATED IN SITU RETORTING OF OIL-SHALE IN A CONTROLLED-STATE RETORT. 3: DYNAMIC OIL FILM THICKNESS ON PARTIALLY RETORTED AND UNRETORTED SHALE**
John J. Duvall Feb. 1982 51 p refs
(DE82-011107; DOE/LC-RI-82-2-Pt-3) Avail: NTIS HC A04/MF A01

The amount of oil washed from the partially retorted and unretorted shales from 14 interrupted runs of the controlled-state retort was used to estimate dynamic oil film thickness on those shales. The data obtained indicate that factors that affect oil viscosity determine oil film thickness. In the heated region of the retort, temperature was the controlling factor for oil film thickness. In the unheated region, controlling factors included proximity to the heated region, gas composition and flow rate, retorting advance rate, and breadth of retorting zone. Factors that affected oil composition and thereby increased viscosity, such as increased gas velocity, oxygen in the retorting gas, slower retorting advance rate, and thinner retorting zone, increased oil film thickness. In the unheated region of the retort, the oil film was thickest nearest the heated region gradually tapering to a more or less constant value approximately 1 meter from the heated region. Oil shale particle size did not affect oil film thickness. DOE

**N83-18009#** Battelle Pacific Northwest Labs., Richland, Wash.
**WESTERN OIL-SHALE DEVELOPMENT, A TECHNOLOGY ASSESSMENT. VOLUME 6: OIL-SHALE DEVELOPMENT IN THE PICEANCE CREEK BASIN AND POTENTIAL WATER-QUALITY CHANGES**
Jan. 1982 22 p refs
(Contract DE-AC06-76RL-01830)
(DE82-005659; PNL-3830-Vol-6; ANL/EES-TM-161-Vol-6) Avail: NTIS HC A02/MF A01

The stream quality changes due to premining pumping activities required to prepare oil shale lease Tracts C-a and C-b for modified in situ retorting are bracketed by assuming all premining pumping is discharged to the surface stream. In one case, the pumped water is assumed to be of a quality like that of the upper aquifer with a relatively high quality. In the second case, the pumped water is assumed to come from the lower aquifer. Complete mixing and conservation of pollutants was assumed at sample points at the White River and at Lees Ferry of the Colorado River. Possible secondary effects of oil shale and coal mining are discussed. The uncertainties associated with the assumptions used and alternative uses for the water to prevent stream contamination by oil shale development are also considered. DOE

**N83-18010#** Los Alamos Scientific Lab., N. Mex.
**RECOVERY OF MINERALS FROM US COALS**
Nicholas E. Vanderborgh 1982 17 p refs Presented at the Process Mineral. Symp. of the 111th AIME Ann. Meeting, Dallas, 15-18 Feb. 1982
(Contract W-7405-eng-36)
(DE82-008173; LA-UR-82-452; CONF-820205-2) Avail: NTIS HC A02/MF A01

Projections show that domestic coal will serve for the majority of energy supplies during the next decades. Thorough chemical cleaning of this coal can be accomplished in long residence time, slurry transport systems to produce high quality fuel product. Concurrently, mineral recovery from coals will supplement existing ores. This concept is described and given preliminary engineering considerations for mineral recovery during transport operations. DOE

**N83-18011#** Bendix Field Engineering Corp., Grand Junction, Colo.
**URANIUM HYDROGEOCHEMICAL AND STREAM SEDIMENT RECONNAISSANCE OF THE ATLIN NTMS QUADRANGLE, ALASKA**
R. J. Zinkl, comp., D. L. Shettel, Jr., comp., S. L. Langfeldt, comp., L. C. Hardy, comp., and R. F. D'Andrea, Jr., comp. Jan. 1982 9 p refs Prepared in cooperation with LASL
(Contract DE-AC13-76GJ-01664)
(DE82-009284; GJBX-17(82)) Avail: NTIS HC A02/MF A01

Results of a hydrogeochemical and stream sediment reconnaissance of the Altin NTMS Quadrangle, Alaska are given. Only 6 samples were taken in the Atlin Quadrangle. Appendix A describes the sample media and summarizes the analytical results for each medium. The data were subdivided by one of the Los Alamos National Laboratory sorting programs of Zinkl and others (1981) into stream-sediment samples. DOE

**N83-18012#** Bendix Field Engineering Corp., Grand Junction, Colo.
**URANIUM HYDROGEOCHEMICAL AND STREAM SEDIMENT RECONNAISSANCE MISHEGUK MOUNTAIN NTMS QUADRANGLE, ALASKA**

S. L. Langfeldt, comp., L. C. Hardy, comp., R. F. DAndrea, Jr., comp., R. J. Zinki, comp., D. L. Shettel, Jr., comp., W. K. Hensley, G. J. Thomas, C. J. Martell, and L. W. Maassen Jan. 1982 85 p refs Prepared in cooperation with LASL, N. Mex.
(Contract DE-AC13-76GJ-01664)
(DE82-009932; GJBX-19(82)) Avail: NTIS HC A05/MF A01

Location data, field analyses, and laboratory analyses of several different sample media are presented. The data are subdivided into groups of stream-sediment and lake sediment samples. For each group which contians a sufficient number of observations, statistical tables, tables of raw data, and 1:1,000,000 scale maps of pertinent elements are included in this report. Also included are maps showing results of multivariate statistical analyses. DOE

**N83-18013#** Weed (Thurlow) and Associates, Inc., Columbus, Ohio.
**DEVONIAN SHALE EXTRACTION TEST WELLS**
Thurlow Weed and Philip J. Henry 30 Nov. 1981 200 p
(Contract DE-AC21-78MC-08386)
(DOE/MC-08386/T1) Avail: NTIS HC A09/MF A01

The results of four types of work performed in four Devonian Shale gas wells in one geology domain geographically located in central Ohio are discussed. It was demonstrated that Devonian age shales can be made to produce natural gas in the shallower one thousand foot depth range which is encountered over such wide areas of the Apalachian, Illinois and Michigan basins. New exploration rationales for locating fractured, or other highly productive reservoirs are discussed. State-of-the-art and advanced logging and stimulation techniques in relation to the geological, stress and reservoir conditions in the Project area are discussed. The economics of the various exploration and stimulation techniques tested are evaluated. DOE

**N83-18014#** Los Alamos Scientific Lab., N. Mex.
**FRACTIONATION OF AN OIL SHALE RETORT PROCESS WATER: ISOLATION OF PHOTOACTIVE GENOTOXIC COMPONENTS**
Gary F. Strniste, Judy M. Bingham, W. Dale Spall, Joyce W. Nickols, Richard T. Okinaka, and David J.-C. Chen 1982 14 p refs Presented at the Symp. on the Appl. of Short-Term Bioassays in the Anal. of Complex Environ. Mixtures, Chapel Hill, N.C., 25-27 Jan. 1982 Submitted for publication
(Contract W-7405-eng-36)
(DE82-010428; LA-UR-82-1272; CONF-820122-2) Avail: NTIS HC A02/MF A01

Attempts to fractionate and to chemically identify photoactive, genotoxic components in a particularly bioactive oil shale retort process water are reported. Fractionated water samples were assessed for mutagenic potential using the Salmonella histidine reversion assay with microsomal activation. The photoactive fractions of the process water was analyzed to define their chemical composition. Several classes of chemical compounds, including alkylated aromatic hydrocarbons, aromatic amines, aldehydes, amides and ketones are prevalent and it is suggested that they contribute to the photo induced genotoxic potential of this oil shale retort process water. DOE

**N83-18015#** Pacific Northwest Lab., Richland, Wash. Technology Assessments Div.
**WESTERN OIL SHALE DEVELOPMENT: A TECHNOLOGY ASSESSMENT. VOLUME 8. HEALTH EFFECTS OF OIL SHALE DEVELOPMENT Final Report**
George J. Rotariu Feb. 1982 45 p refs 8 Vol.
(Contract DE-AC06-76RL-01830)
(DE82-008695; PNL-3830-Vol-8; LA-UR-81-1785) Avail: NTIS HC A03/MF A01

Information on the potential health effects of a developing oil shale industry is given. The industry should be alert to the incidence of skin disease in the industrial setting. However, automated techniques, modern industrial hygiene practices and realistic personal hygiene should greatly reduce the hazards associated with skin contact. The entire question of regional water contamination and any resultant health hazard has not been adequately addressed. The industrial practice of hydrotreating the crude shale oil will diminish the carcinogenic hazard of the product. However, the quantitative reduction of biological activity is dependent on the degree of hydrotreatment. Both Soviet and American experimentalists demonstrated a correlation between carcinogenicity/toxicity and retorting temperature; the higher temperatures producing the more carcinogenic or toxic products. DOE

**N83-18016#** Oak Ridge National Lab., Tenn. Chemical Technology Div.
**METAL RECOVERY FROM EASTERN OIL SHALE**
T. M. Gilliam, R. M. Canon, A. D. Ryon, and J. S. Watson 1981 13 p refs Presented at the Eastern Oil Shale Symp., Lexington, Ky., 15-17 Nov. 1981
(Contract W-7405-eng-26)
(DE82-004052; CONF-811169-1-Draft) Avail: NTIS HC A02/MF A01

Results are shown for the acid extractability of several minerals from: (1) raw shale, (2) shale that has been retorted with hydrogen under pressure, and (3) retort residue that has been subjected to an oxidative roast. Six elements (Al, Co, Fe, Mo, U, and V) were identified as having the greatest probability for economical recovery. Conceptual process flowsheets for their recovery are presented. DOE

**N83-18142#** Geological Survey, Washington, D. C.
**PERSPECTIVES IN GROUNDWATER**
George H. Davis *In* Illinois State Geological Survey Perspectives in Geol. 1982 p 19-23 refs (For primary document see N83-18138 08-46)
Avail: NTIS HC A04/MF A01 CSCL 08G

# 44 ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *85 Urban Technology and Transportation.*

**N83-18017** Department of Energy (US), London (England).
**DEVELOPMENT OF THE OIL AND GAS RESOURCES OF THE UNITED KINGDOM. A REPORT TO PARLIAMENT BY THE SECRETARY OF STATE FOR ENERGY Annual Report, 1982**
Apr. 1982 69 p refs Original contains color illustrations
(ISBN-0-11-411123-5) Copyright. Avail: Issuing Activity

The development of the oil and gas resources of the United Kingdom is described and estimates of oil and gas reserves on the United Kingdom continental shelf are given. Exploration, production and operational aspects, and economic and industrial impacts are addressed. M.G.

**N83-18018** Department of Energy (US), London (England).
**ADVISORY COUNCIL ON ENERGY CONSERVATION. REPORT TO THE SECRETARY OF STATE FOR ENERGY.**
1982 39 p refs
(EP-49; ISSN-0-11-411122-7) Copyright. Avail: HMSO £3.70 PHI

An assessment is given of energy conservation measures in the United Kingdom. It is concluded that significant progress was made and that the strongest and most necessary part of any energy conservation program is energy pricing on the basis of true long run replacement costs. Domestic, industrial, and transportation energy are discussed. The role of controls and energy management systems are discussed. Hot water heating, thermal insulation, and heating systems are also discussed. R.J.F.

**N83-18019** Department of Energy (US), London (England). Statistical Service Dept.
**DIGEST OF UNITED KINGDOM ENERGY STATISTICS, 1982**
1982 125 p refs
(ISBN-0-11-411124-3) Copyright. Avail: HMSO, £11.50 PHI

United Kingdom energy statistics are given. General energy statistics and tables showing each fuel in original units of measurement, in coal equivalent, in oil equivalent and in terms of the thermal content of fuel are given. The estimated value of purchases of fuels, energy consumption by final users and an analysis of energy consumption by main industrial groups are given. Charts showing the trends of primary fuel consumption and demand by final consumers of energy are given. Individual fuels, prices and values of fuels and foreign trade in fuels are listed. R.J.F.

**N83-18020** Department of Energy (US), London (England). Energy Technology Support Unit.
**THE IRON AND STEEL INDUSTRY. ENERGY CONSUMPTION AND CONSERVATION IN THE IRON AND STEEL INDUSTRY**
P. B. Taylor Apr. 1982 157 p refs Prepared in cooperation with Dept. of Industry, London Original contains color illustrations
(Energy-Audit-Ser-16) Copyright. Avail: Issuing Activity

The consumption of energy by the industry as a whole is considered. The individual manufacturing processed are examined with particular emphasis being placed upon important energy losses. These data are then collated into an overall energy flow diagram for the industry in addition to a description of the plant destinations of the various fuel types. Energy flows and cost effective energy conservation in the basic unit manufacturing processes of the industry are emphasized. S.L.

**N83-18021** International Inst. for Applied Systems Analysis, Laxenburg (Austria).
**TWO GLOBAL SCENARIOS: THE EVOLUTION OF ENERGY USE AND THE ECONOMY TO 2030**
Verne G. Chant Nov. 1981 83 p refs
(IIASA-RR-81-35; ISBN-3-7045-0026-7) Copyright. Avail: Issuing Activity

Energy in a Finite World: A Global Systems Analysis (Ballinger, Cambridge, Massachusetts, 181, 880 pages) documents the seven-year study of the future balance of energy supply and demand made by the IIASA Energy Systems Program. Part IV of this book, Balancin Supply and Demand: The Quantitative Analysis, presents results based on two scenarios of global and regional development. Based on the data available when the work was done, these scenarios specify population growth, aggregate economic development in five sectors, and detailed energy use and supply for seven global regions. The scenarios specify energy requirements for households, transportation, and economic activity, and estimate energy supply regionally and globally. These scenario projections are described and analyzed within the economic framework, including aggregate economic models, that was used in deriving the projections. To understand the context of this report and to appreciate the full range of its findings, one must read it in conjunction with the book cited above. ESA

**N83-18022*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
**EVALUATION OF PRODUCTION VERSION OF THE NASA IMPROVED INORGANIC-ORGANIC SEPARATOR**
Dean Sheibley Jan. 1983 28 p refs
(NASA-TM-83018; E-1453; NAS 1.15:83018) Avail: NTIS HC A03/MF A01 CSCL 10A

The technology of an inorganic-organic (I/O) separator, which demonstrated improved flexibility, reduced cost, production feasibility and improved cycle life was developed. Substrates to replace asbestos and waterbased separator coatings to replace the solvent based coatings were investigated. An improved fuel cell grade asbestos sheet was developed and a large scale production capability for the solvent based I/O separator was demonstrated. A cellulose based substrate and a nonwoven polypropylene fiber substrate were evaluated as replacements for the asbestos. Both the cellulose and polypropylene substrates were coated with solvent based and water based coatings to produce a modified I/O separator. The solvent based coatings were modified to produce aqueous separator coatings with acceptable separator properties. A single ply fuel cell grade asbestos with a binder (BTA) was produced. It has shown to be an acceptable substrate for the solvent and water based separator coatings, an acceptable absorber for alkaline cells, and an acceptable matrix for alkaline fuel cells. The original solvent based separator (K19W1), using asbestos as a substrate, was prepared. S.L.

**N83-18023*#** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
**COMPARATIVE VALUES OF ADVANCED SPACE SOLAR CELLS**
Luther W. Slifer, Jr. Sep. 1982 21 p refs Presented at the 16th IEEE Photovoltaic Spec. Conf., San Diego, Calif., 27-30 Sep. 1982
(NASA-TM-84951; Rept-711; NAS 1.15:84951) Avail: NTIS HC A02/MF A01 CSCL 10A

A methodology for deriving a first order dollar value estimate for advanced solar cells which consists of defining scenarios for solar array production and launch to orbit and the associated costs for typical spacecraft, determining that portion affected by cell design and performance and determining the attributable cost differences is presented. Break even values are calculated for a variety of cells; confirming that efficiency and related effects of radiation resistance and temperature coefficient are major factors; array tare mass, packaging and packing factor are important; but cell mass is of lesser significance. Associated dollar values provide a means of comparison. Author

**N83-18024*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
**SEMICONDUCTOR PHOTOELECTROCHEMISTRY**
A. Martin Buoncristiani (Christopher Newport Coll.) and Charles E. Byvik Jan. 1983 94 p refs
(Grant NsG-1514)
(NASA-TP-2088; L-15495; NAS 1.60:2088) Avail: NTIS HC A05/MF A01 CSCL 10A

Semiconductor photoelectrochemical reactions are investigated. A model of the charge transport processes in the semiconductor, based on semiconductor device theory, is presented. It incorporates the nonlinear processes characterizing the diffusion and reaction of charge carriers in the semiconductor. The model is used to study conditions limiting useful energy conversion, specifically the saturation of current flow due to high light intensity. Numerical results describing charge distributions in the semiconductor and its effects on the electrolyte are obtained. Experimental results include: an estimate rate at which a semiconductor photoelectrode is capable of converting electromagnetic energy into chemical energy; the effect of cell temperature on the efficiency; a method for determining the point of zero zeta potential for macroscopic semiconductor samples; a technique using platinized titanium dioxide powders and ultraviolet radiation to produce chlorine, bromine, and iodine from solutions containing their respective ions; the photoelectrochemical properties of a class of layered compounds called transition metal thiophosphates; and a technique used to produce high conversion efficiency from laser radiation to chemical energy. S.L.

**N83-18025*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
**CHALCOGENOPHOSPHATE PHOTOELECTRODES Patent Application**
Benjamin Reichman (Christopher Newport Coll.) and Charles E. Byvik, inventors (to NASA) Filed 7 Oct. 1982 14 p
(NASA-Case-LAR-12958-1; US-Patent-Appl-SN-433196) Avail: NTIS HC A02/MF A01 CSCL 10A

A device for converting light energy into other forms of useful energy such as electrical or chemical energy is described. A photoelectrode is manufactured from a layered chalcogenophosphate (MPX3) compound employed in a photoelectrochemical cell

where M is selected from the group consisting of the transition metal series of elements beginning with scandium (atomic number 21) through germanium (atomic number 32), yttrium (atomic number 39) through antimony (atomic number 51), and lanthanum (atomic number 57) through polonium (atomic number 84); P is phosphorus; and X is selected from the chalogenide series consisiting of sulfur, selenium, and tellerium. The photoelectrochemical cell is comprised of a container which retains an acidic electrolyte solution, an MPX3 photoelectrode, and a counterelectrode. In the preferred embodiment, the photoelectrochemical cell is set up as a photoelectrolysis cell. NASA

**N83-18026#** Krupp Stahl A.G., Bochum (West Germany). Hauptbereich Energiewirtschaft.

**UTILIZATION OF INDUSTRIAL WASTE HEAT, CITING AN INTEGRATED IRON AND STEEL WORKS AS AN EXAMPLE TO SAVE PRIMARY ENERGY AND TO REDUCE THE BURDEN ON THE ENVIRONMENT, VOLUME 1 Final Report, Dec. 1980**

Hans-Guenther Poettken and Herbert Strohschein Bonn Bundesministerium fuer Forschung und Technologie Aug. 1982 488 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie 2 Vol.

(BMFT-FB-T-82-151-Vol-1; ISSN-0340-7608) Avail: NTIS HC A21/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 76,50

The utilization of waste heat to substitute primary energy is an essential factor to complement the savings of primary energy achieved by changes in the design of industrial plant and processes. The potential for waste energy utilization in an integrated iron and steel works were investigated in technical and economic terms. It is found that possibilities for utilizing such energy always obtain when waste energy is produced fairly continuously at an appreciable temperature level and in adequate quantity. Economic analysis shows that with present day energy prices it is only a question of time before the recovery of waste energy, which is technically feasible, becomes feasibile. E.A.K.

**N83-18027#** Krupp Stahl A.G., Bochum (West Germany). Hauptbereich Energiewiertschaft.

**UTILIZATION OF INDUSTRIAL WASTE HEAT, CITING AN INTEGRATED IRON AND STEEL WORKS AS AN EXAMPLE TO SAVE PRIMARY ENERGY AND TO REDUCE THE BURDEN ON THE ENVIRONMENT, VOLUME 2 Final Report, Dec. 1980**

Hans-Guenther Poettken and Herbert Strohschein Bonn Bundesministerium fuer Forschung und Technologie Aug. 1982 116 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie 2 Vol.

(BMFT-FB-T-82-151-Vol-2; ISSN-0340-7608) Avail: NTIS HC A06/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 76,50

The potential of waste energy utilization in an integrated iron and steel works were investigated in technical and economic terms. The utilization of wste heat to substitute primary energy is an essential factor to complement the savings of primary energy achieved by changes in the design of industrial plant and processes. It is found that possibilities for utilizing such energy is obtained when waste energy is produced fairly continuously at an appreciable temperature level and in adequate quantity. Economic analysis shows that with present day energy prices the recovery of waste energy is only a question of time which is technically feasible and becomes an economic proposition. The increasing use of waste energy in the steel industry or elsewhere is no alternative to the expansion of other energy producing facilities. E.A.K.

**N83-18028#** Aeronautical Research Inst. of Sweden, Stockholm. Structures Dept.

**AEROELASTIC STABILITY AND DYNAMIC RESPONSE ANALYSIS OF THE LDB-125 VERTICAL AXIS WIND TURBINE**

Arne Vollan (ASS Consulting, Hagnan, West Ger.) Aug. 1982 57 p refs

(Contract NE-5061-452)

(FFA-TN-1982-19) Avail: NTIS HC A04/MF A01

The stability and the dynamic response behavior of the proposed vertical axis wind turbine LDB-125 was investigated. The LDB rotor imposes many new and unconventional features like double L blades, inclined tower, rotating base, extensive use of guy wired. A dynamic response and stability analysis was performed using a complex calculation model to minimize the risk of neglecting significant physical effects. It is shown, that the LDB-125 rotor has no instabilities or dangerous resonance regions in the normal operating range of rotational velocity. E.A.K.

**N83-18029#** Institute of Geological Sciences, London (England). Geophysics and Hydrogeology Div.

**INVESTIGATION OF THE GEOTHERMAL POTENTIAL OF THE UK. THE SOUTHAMPTON (WESTERN ESPLANADE) GEOTHERMAL WELL: A PRELIMINARY ASSESSMENT OF THE RESOURCE**

R. A. Downing, D. J. Allen, W. G. Burgess, I. E. Smith, and W. M. Edmunds 10 May 1982 67 p refs Sponsored by Dept. of Energy, Southampton City Council and EEC

Avail: NTIS HC A04/MF A01

The Southampton No 1 (Western Esplanade) geothermal well which was drilled for the development of hot brines in the Triassic sandstones was tested. The aquifer was intersected at a depth of 1729 m. The upper 24 m contained thin, medium to coarse grained sandstones which are the main water bearing horizons. The static water level is about 80 m below ground level. Gas lifting with nitrogen indicate that the sandstones contain a brine with a salinity of 125 g/l at a temperature of 76 deg C. The maximum yield of the well was 30 l/s for a pressure reduction of 4.2 MN/sq m. The transmissivity of the aquifer is about 5 Dm. A hydraulic barrier, probably a fault, occurs close to the well. E.A.K.

**N83-18030#** Stuttgart Univ. (West Germany). Inst. fuer Statik und Dynamik.

**LINEAR STATIC AND DYNAMIC ANALYSIS FOR HINGED ROTOR BLADES OF 60 m SPAN FOR A TWO BLADED HORIZONTAL AXIS WIND ENERGY CONVERTER**

J. H. Argyris, K. A. Braun, and B. Kirchgaessner 1981 53 p refs Presented at vonKarman Inst. Lecture Ser. 1981-8 on Wind Energy Conversion Devices, Rhode Saint Genese, Belg., 1-5 Jun. 1981

(Contract BMFT-ET-4086-A)

(ISD-291; ISSN-0170-6071) Avail: NTIS HC A04/MF A01

The linear static and dynamic behavior of a rotor blade of a horizontal axis wind energy converter with flap and lag hinges and with coupling of flap and pitch was investigated. The linearized equations of motion are developed using a finite element idealization considering quasisteady aerodynamic forces. The complex eigenfrequencies are calculated. The time history response of the rotor blade is computed for cyclic gravitational loads at rated operation and for a global gust. The stresses at selected points along the blade and forces and moments acting on the tower are calculated from the structural deformation. E.A.K.

**N83-18031#** Gewerkschaft Sophia-Jacoba, Hueckelhoven (West Germany). Steinkohlenbergwerk.

**CONSTRUCTION AND OPERATION OF A CENTRAL HEATING PLANT PROTOTYPE HEATED BY COAL DUST CORRESPONDING TO THE SCHOPPE SYSTEM Final Report, Aug. 1981**

Wilhelm Wenz Bonn Bundesministerium fuer Forschung und Technologie Nov. 1982 121 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie

(BMFT-FB-T-82-176; ISSN-0340-7608) Avail: NTIS HC A06/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 25,50

Fluicit fired boiler plants in central heating systems are an alternative to oil and gas fired plants in economical and technical respect. Fluicid is the name of a fuel from coal dust. In more than 2.700 running hours the heat and service water consumption of the coop building was covered by this pulverized fuel fired heating plant with a capacity of 2,5 GJ/h without any problems.

Each installation of the plant, from fuel supply to ash removal, is examined and improved. E.A.K.

**N83-18032#** Karlsruhe Univ. (West Germany). Lehrstuhl fuer Chemik und Technik.

**EXTRACTION OF COAL WITH SOLVENTS IN LIQUID AND SUPERCRITICAL STATE UNDER NONHYDROGENATING AND HYDROGENATING CONDITIONS Final Report, May 1982**

Achim Wilhelm and Kurt Hedden Bonn Bundesministerium fuer Forschung und technologie Oct. 1982 228 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministeerium fuer Forschung und Technologie

(BMFT-FB-T-82-177; ISSN-0340-7608) Avail: NTIS HC A11/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 39

The basic steps of coal extraction to determine the optimum conditions for obtaining a higher coal conversion yield in a technical process of supercritical coal extraction were examined. A fixed bed of coal was slowly heated up in a current of pressurized solvent by a nonisothermal technique. The solvent changes its physical state during extraction from a liquid to a supercritical fluid. The formation rates of extract and gaseous products and their integral yields were measured under different extraction conditions. Various coals and lignites as well as different solvents including H-donor solvents and the effect of the addition of molecular hydrogen to the supercritical phase with and without catalyst were studied. Results are interpreted with an extraction scheme, comprising chemical reactions, phase equilibria and transport processes as single steps of the complex extraction procedure. Using a simplified mathematical model, the formation rates of extract as a function of temperature were quantitatively described with effective kinetic parameters. New process for the hydrogenating supercritical extraction of coal, which produces high coal conversion yields is proposed. E.A.K.

**N83-18033#** Erno Raumfahrttechnik G.m.b.H., Bremen (West Germany).

**STUDY BASED ON AMMONIA/WATER SOLUTIONS OF A DISTRICT HEATING TRANSPORT SYSTEM Final Report, Jun. 1981**

Juergen Peter Hoffmann Bonn Bundesministerium fuer Forschung und Technologie Oct. 1982 193 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie

(BMFT-FB-T-82-188; ISSN-0340-7608) Avail: NTIS HC A09/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 36

The technical and economical capabilities of ammonia-water solutions for the transport of heat from a large cogenerating power plant to a transfer station near the consumers were studied. The necessary mass flows are established at ambient temperatures within cold pipelines. Based on the thermodynamics of ammonia-water solutions a class of cycles suitable for heat transport was defined by using a computer program for the technical and economical aspects. Specific costs of heat transport were compared with the cost of a conventional hot water system. It is shown that an ammonia-water system has economical advantages, if the heat load is smaller than about 300 MJ/s and the transport distance exceeds 60 km. E.A.K.

**N83-18034#** Chemische Werke, Huels (West Germany).

**PRE-FEASIBILITY STUDY FOR CONSTRUCTION OF A COMMERCIAL COAL HYDROGENATION PLANT Final Report, Mar. 1982**

Winfried Hahn, Huewels Wilhelm, Helmut Kleinhueckelkotten (VEBA OEL AG), and Bernhard Schmedeshagen (VEBA OEL AG) Bonn Bundesministerium fuer Forschung und Technologie Nov. 1982 125 p In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie

(BMFT-FB-T-82-190; ISSN-0340-7608) Avail: NTIS HC A06/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 26

The technical problems, a suitable site and the unsatisfactory economics hinder the realization of a commercial coal liquefaction plant in Germany were identified. It is found that a plant for hydrogenation of coal and heavy oil according to the updated bergius-Pier process can be built. The improvement of acceptable reactor loading and increase of product yield was considered. The infrastructure aspects of a site for the plant which covers 300 hectars as well as eventually existing atmospheric pollution conditions in the environment are also considered. E.A.K.

**N83-18035#** North Carolina Agricultural and Technical State Univ., Greensboro. School of Engineering.

**RENEWABLE ENERGY SYSTEM FEASIBILITY STUDY Final Report, 2 Sep. 1980 - 30 Apr. 1982**

D. E. Klett, D. Y. Goswami, D. E. Olson, and E. K. Stefanakos Wright-Patterson AFB, Ohio AFWAL Aug. 1982 102 p refs (Contract F33615-80-K-3626; AF Proj. 2404)

(AD-A121252; AFWAL-TR-82-3050) Avail: NTIS HC A06/MF A01 CSCL 10/2

A study was performed to determine the economic feasibility of displacing a portion of the electrical energy usage at the Wind tunnel Complex at WPAFB by a renewable energy system. Wind systems, photovoltaic systems and solar thermal systems evaluated using lifecycle cost analysis. Economic feasibility was not found for any of the systems evaluated. Author (GRA)

**N83-18036#** Notre Dame Univ., Ind. Dept. of Aerospace and Mechanical Engineering.

**ENERGY CONSERVATION IN ELECTROSTATIC FABRIC FILTRATION OF INDUSTRIAL DUST Final Report**

Teoman Ariman Dec. 1981 63 p refs

(Contracts DE-AS02-77CS-40051; EC-77-S-2-4428)

(DE82-006897; DOE/CS-40051/1) Avail: NTIS HC A04/MF A01

An external electric field was utilized in the industrial dust control by fabric filters with very promising initial results. A substantial decrease in the pressure drop and an increase in collection efficiency were observed. The detailed outcome of the experimental research program in electrostatic fabric filtration is presented. The results show that pressure drop decreases substantially with the increased electrostatic field strength for all relevant parameters. Futhermore, the data of the experimental program was utilized to develop a semi-empirical model for the determination of the pressure drop and to establish an energy-optimized design criteria. DOE

**N83-18037#** New Mexico Univ., Albuquerque. Dept. of Mechanical Engineering.

**POTENTIAL FOR DOMESTIC HEAT RECOVERY Final Report, 1 Jan. - 31 Dec. 1980**

K. T. Feldman, Jr. and G. J. Tsai Nov. 1981 73 p refs

(DE82-901395; NP-2901395; EMD-2-68-1106;

ME-112(81)EMD-870-1) Avail: NTIS HC A04/MF A01

The potential for reducing gas-fired heating costs by the use of waste heat is discussed. A heat recovery heat exchanger can be installed to recover waste heat from the hot exhaust gases going up the flue pipe from a furnace, water heater, or clothes dryer. Some specific designs are described for heat recovery equipment. Specific design and performance of the Hallofin heat exchanger and the heat pipe heat exchanger are evaluated. DOE

**N83-18038#** Idaho National Engineering Lab., Idaho Falls.

**OPPORTUNITIES FOR DIRECT-CONTACT WASTE HEAT RECUPERATORS FOR INDUSTRIAL HEAT RECOVERY**

S. L. Richlen and T. T. Semler 1981 7 p refs Presented at the IECEC Conf., Atlanta, 9 Aug. 1981

(Contract DE-AC07-76ID-01570)

(DE82-006280; CONF-810812-40) Avail: NTIS HC A02/MF A01

The potential industrial applications of the direct-contact waste heat recuperator (DCWHR) for the 353 K to 672 K temperature range were identified. The DCWHR increases the heat transfer area per unit volume over typical heat exchangers, and holds promise for latent heat recovery from waste streams. Results show that, for selected industrial waste heat sources, the production of hot process water by direct-contact heat exchange can be

economically accomplished for waste heat (hot gas) streams at 478 K to 672 K with greater than 4.72 cu m/sec exhaust. Additionally, a DCWHR is particularly recommended for particulate-laden exhaust streams where scrubbing is already required by environmental consideration; the recovered heat becomes a factor in reducing the negative cash flow attributable to the use of scrubbing equipment. Incentives and obstacles to early market penetration of the technology are recognized. DOE

**N83-18039#** Massachusetts Inst. of Tech., Cambridge. System Dynamics Group.
**THE ENERGY TRANSITION AND THE MACROECONOMY: A FRAMEWORK FOR POLICY ANALYSIS Final Report**
John D. Sterman Dec. 1981 668 p refs
(Contract DE-AC02-80PE-70228)
(DE82-007839; DOE/PE-70228/1) Avail: NTIS HC A99/MF A01

An integrating framework designed to evaluate the effects of depletion and rising energy prices on economic growth, inflation, and other key economic and energy indicators over the time frame 1980 to 2050 is discussed. The framework provides a general disequilibrium representation of the major linkages between the energy sector and the economy. Gross national product, consumption, investment, wages and prices, and other major energy and economic aggregates are determined endogenously. Though the framework generates the macroeconomic dynamics of the economy, it is based on an explicity behavioral theory of economic decision-making at the microeconomic level of individuals and firms. Results show a substantial potential for the first-order effects of depletion (rising capital requirements for energy production, rising real energy prices) to be amplified by feedback mechanisms in the economy, worsening economic performance. DOE

**N83-18040#** Los Alamos Scientific Lab., N. Mex.
**A DATA-GATHERING METHOD FOR USE IN MODELING ENERGY RESEARCH, DEVELOPMENT AND DEMONSTRATION PROGRAMS**
Mary A. Meyer, Jane M. Booker, Hatice S. Cullingford, and Alfred T. Peaslee, Jr. 1981 11 p refs Presented at the 4th Intern. Conf. on Alternative Energy Sources, Miami Beach, Fla., 14-16 Dec. 1981
(Contract W-7405-eng-36)
(DE82-006153; LA-UR-81-3619; CONF-811212-8) Avail: NTIS HC A02/MF A01

The development and testing of a data-gathering method for use in a computer program designed to model energy research, development, and demonstration programs for decisionmakers are described. The data-gathering method consists of face-to-face interviews with the scientists working on the projects that will be modeled by the computer program. The basic information gained from an interview includes time estimates for reaching certain project goals and the probability of achieving those goals within the times estimated. The interview method is based on decision analysis techniques. The Magnetic Fusion Energy program of the US Department of Energy was selected as the test case. The data gathering method was used at five fusion projects to determine whether it could meet its design criteria. Extensive statistical analysis was performed to learn how much the expert's answers agreed, what factors were likely to enter into their estimates, and how their estimates corresponded. DOE

**N83-18041#** Tufts Univ., Medford, Mass.
**THE NEW ENGLAND ENERGY CONGRESS PROJECT Final Report, Jun. 1978 - Jul. 1980**
20 Nov. 1981 58 p refs
(Contract DE-AC02-78EV-10131)
(DE82-005521; DOE/EV-10131/8) Avail: NTIS HC A04/MF A01

The Energy Congress' activities, consensus decision-making process and its findings are discussed. The results of a thorough evaluation conducted through the mail and by phone of participants, outside observers and from Capital Hill are given. The clear conclusion is that the Energy Congress made a unique and significant contribution towards enabling New Englanders, both in the region and in Washington, to set energy goals and priorities and to begin serious efforts to reduce the region's precarious dependence on oil imports. DOE

**N83-18042#** Los Alamos Scientific Lab., N. Mex.
**THE PROMISE AND STATUS OF INTERNATIONAL APPLICATIONS OF PHOTOVOLTAICS**
J. H. Altseimer and M. C. Krupka 1981 25 p refs Presented at the 4th Intern. Conf. on Alternative Energy Sources, Miami Beach, Fla., 14 Dec. 1981
(Contract W-7405-eng-36)
(DE82-006152; LA-UR-81-3641; CONF-811212-7) Avail: NTIS HC A02/MF A01

Substantial marketing opportunities for selected PV applications, despite high costs exist mostly in the developing nations. The Ivory Coast Mexico, and the Republic of South Africa were reviewed for their potential as PV consumers. The US, France, West Germany, and Japan are the major industrial nations conducting research, development and commercialization programs on PV. At least twelve other countries are involved to a lesser degree. In technology, the US is ahead but the programs and the progress in the other three major countries are nevertheless significant. Japan is also developing its own technology base and systems and may soon decide to become more active in the market place. Federal funding in the US for PV is being drastically reduced. Governmental funding in the other three major nations is relatively strong and appears to be growing. DOE

**N83-18043#** Sandia Labs., Albuquerque, N. Mex.
**THE 5 MW FOR SOLAR-CHEMISTRY DEVELOPMENT**
John T. Holmes 1981 16 p refs Presented at the AICHE Natl. Meeting, Orlando, Fla., 28 Feb. - 4 Mar. 1982
(Contract DE-AC04-76DP-00789)
(DE82-002064; SAND-81-1284C; CONF-820202-2) Avail: NTIS HC A02/MF A01

The US-DOE, 5MW solar Central Receiver Test Facility (CRTF) operates to develop and proof-test high efficiency solar receivers and collectors (heliostats) for applications such as electricity generation and process heating. The capabilities of CRTF for solar chemical process development studies are described and related to chemical reactant heating rates. A Sun Fuels program is planned to demonstrate a process for upgrading both nonrenewable and renewable feedstocks into conventional fuels. To additionally benefit from the high intensity light source, studies on the direct solar pyrolysis of metal halides and carbonyls to produce high purity, high value metals are recommended. DOE

**N83-18044#** Massachusetts Inst. of Tech., Cambridge.
**DATA REPORT FOR THE NORTHEAST RESIDENTIAL EXPERIMENT STATION, OCTOBER 1981**
M. C. Russell, P. Raghuraman, and P. C. Mahoney Nov. 1981 14 p
(Contract DE-AC02-76ET-20279)
(DE82-007648; DOE/ET-20279/174) Avail: NTIS HC A02/MF A01

The Residential Experiment Stations of the Solar Photovoltaic Residential Project were designed to develop residential photovoltaic systems and to gather and disseminate performance data for the photovoltaic community, cognizant institutions and, ultimately, the public. Physical performance data for the month of October 1981 obtained from photovoltaic energy systems under test at the Northeast Residential Experiment Station in Concord, Massachusetts are tabulated. DOE

**N83-18045#** Pacific Northwest Lab., Richland, Wash.
**COST OF HEAT FROM A SEASONAL SOURCE**
R. W. Reilly, D. R. Brown, and H. D. Huber 1981 10 p Presented at the Intern. Energy Storage Conf., Seattle, 19 Oct. 1981
(Contract DE-AC06-76RL-01830)
(DE82-006026; PNL-SA-9891; CONF-811066-7) Avail: NTIS HC A02/MF A01

Results are reported of an investigation to estimate the cost of aquifer thermal energy storage (ATES) from a seasonal heat source. The cost of supplying energy (hot water) from an ATES

system is estimated. Three types of loads are investigated: point demands, residential developments, and a multidistrict city. Several technical and economic factors are found to control the economic performance of an ATES system. Costs are found to be prohibitive for systems of small size, long transmission distances, and employing expensive purchased thermal energy. ATES is found to be cost-competitive with oil-fired and electric hot water delivery systems under a broad range of potential situations. DOE

**N83-18046#** Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
**COMPARISON OF HEAT PUMP WATER HEATERS AND SOLAR DOMESTIC WATER HEATERS**
Louise Morrison and David E. Claridge Dec. 1981 6 p refs Presented at the Semiann. Meeting of the Am. Soc. of Heating, Refrigerating, and Air Conditioning Engr., Houston, Tex., 24-28 Jan. 1982
(Contracts DE-AC02-77CH-00178; EG-77-C-01-4042)
(DE82-006117; SERI/TP-254-1482; CONF-820112-1) Avail: NTIS HC A02/MF A01

The heat pump water heater (HPWH) is described and life-cycle cost analyses are presented for the HPWH and the solar domestic water heater. DOE

**N83-18047#** Pacific Northwest Lab., Richland, Wash.
**PACIFIC NORTHWEST BIOMASS AS AN ENERGY RESOURCE**
A. D. Chockie Nov. 1981 13 p refs Presented at the 4th Inter. Conf. on Alternative Energy Sources, Miami Beach, Fla., 14 Dec. 1981
(Contract DE-AC06-76RL-01830)
(DE82-005804; PNL-SA-9982; CONF-811212-11) Avail: NTIS HC A02/MF A01

A review of the biomass resource base in the Northwest scenarios and a preliminary analysis of the issues involved in the collection and use of forest residues as an energy resource are presented. DOE

**N83-18048#** Rockwell International Corp., Thousand Oaks, Calif.
**ENHANCED STABILITY OF PHOTOELECTRODES WITH ELECTROGENERATED POLYANILINE FILMS**
Rommel Noufi, Arthur J. Nozik, John White, and Les F. Warren Jan. 1982 17 p refs Presented at the Electrochem. Soc. Conf., Denver, 11 Oct. 1981 Prepared in cooperation with Midwest Research Inst., Golden
(Contracts DE-AC02-77CH-00178; EG-77-C-01-4042)
(DE82-007001; SERI/TP-211-1494; CONF-811013-16) Avail: NTIS HC A02/MF A01

Polyaniline was electrodeposited on platinum and semiconducting (Cd-chalcogenides, Si, GaAs, GaP) electrodes from aqueous solution (pH = 1) containing aniline. The electrochemical behavior of such films was examined in aqueous and nonaqueous solutions by cyclic voltametry. Results show that the polyaniline film is conducting in both cathodic and anodic regions at pH < 3 as evidenced by the electrochemical redox reactions of various redox couples on polyaniline-coated electrodes. In general, all polyaniline coated semiconductor electrodes examined exhibited enhanced stability of the photocurrent when compared to that of the naked electrodes. DOE

**N83-18049#** Brookhaven National Lab., Upton, N. Y. Dept. of Energy and Environment.
**AN ANALYSIS OF SELECTED SURFACE CHARACTERISTICS AND LATENT HEAT STORAGE FOR PASSIVE SOLAR SPACE HEATING**
V. Fthenakis and R. Leigh Dec. 1981 16 p refs Presented at the 4th Intern. Conf. on Alternative Energy Sources, Miami, Fla., 14-16 Dec. 1981
(Contract DE-AC02-76CH-00016)
(DE82-006932; BNL-30441; CONF-811212-12) Avail: NTIS HC A02/MF A01

Results are presented of an analysis of the value of various technical improvements in the solar collector and thermal storage subsystems of passive solar residential, agricultural, and industrial systems for two regions of the country. The evaluated improvements are: decreased emissivity and increased absorptivity of absorbing surfaces, decreased reflectivity, and decreased emissivity of glazing surface, and the substitution of sensible heat storage media with phase change materials. The value of each improvement is estimated by the additional energy savings resulting from the improvement. DOE

**N83-18050#** Los Alamos Scientific Lab., N. Mex.
**SOLAR-ABSORBER-SELECTIVE PAINT RESEARCH**
Stanley W. Moore 1982 9 p refs Presented at the Soc. of Photo-Optical Instr. Engrs., Los Angeles, 25-29 Jan. 1982
(Contract W-7405-eng-36)
(DE82-006104; LA-UR-81-3610; CONF-820107-3) Avail: NTIS HC A02/MF A01

Research and development on thickness-sensitive and thickness-insensitive solar paints are discussed. The thickness-sensitive paints include reverse roll coated, gravure printed, and spray coated paints. The coating methods and optical properties of the thickness-sensitive paints are discussed. The thickness-insensitive solar paints include a low emittance flake such as aluminum-flake, and pigment. Durability tests are discussed, including accelerated weathering and humidity durability tests, for the thickness-sensitive coatings. DOE

**N83-18051#** Charles River Associates, Inc., Boston, Mass.
**ANALYTICAL AND POLICY ISSUES IN ENERGY ECONOMICS: USES OF THE FRS DATA BASE**
Dec. 1981 99 p refs
(Contract DE-AC01-81EI-10752)
(DE82-004258; CRA-591) Avail: NTIS HC A05/MF A01

The relevant literature concerning several major analytical and policy issues in energy economics is reviewed and criticized. The possible uses of the Financial Reporting System (FRS) data base for the analysis of energy policy issues are investigated. Certain features of FRS data suggest several ways in which the data base can be used by policy makers. FRS data are collected on the firm level, and different segments of the same firm operating in different markets can be separately identified. The methods of collection as well as FRS's elaborate data verification process guarantee a high degree of accuracy and consistency among firms. DOE

**N83-18052#** Atlas Corp., Santa Cruz, Calif.
**PROCEEDINGS OF THE FIFTH ANNUAL GEOTHERMAL CONFERENCE AND WORKSHOP**
Nov. 1981 292 p refs Conf. held in San Diego, Calif., 23-25 Jun. 1981 Sponsored by EPRI
(EPRI Proj. WS-81-197)
(DE82-901295; EPRI-AP-2098; CONF-8106135) Avail: NTIS HC A13/MF A01

Various aspects of geothermal energy utilization are discussed. Geysers, turbines, and steam are discussed. Pilot plant operations are assessed. Economic strategies are considered. DOE

**N83-18053#** Pacific Northwest Lab., Richland, Wash.
**HYBRID SOLAR-WIND ENERGY CONVERSION SYSTEMS METEOROLOGICAL ASPECTS**
C. I. Aspliden Dec. 1981 16 p refs Presented at the WMP Tech. Conf. on Meteorol. and Energy, Mexico City, 3-7 Nov. 1981
(Contract DE-AC06-76RL-01830)
(DE82-005798; PNL-SA-10063; CONF-811175-1) Avail: NTIS HC A02/MF A01

Both the solar and wind resources available in the boundary layer vary in time and space. Data indicate, however, that the availability of the two resources may complement each other on both short and long term bases in many regions to meet different load requirements in various applications. This suggests that solar-wind hybrid systems may be more attractive and suitable to meet specific power demands and/or to avoid expensive storage systems (or expansion of conventional systems) than wind or solar energy extracting systems alone. To investigate the feasibility of operation of hybrid wind-solar systems at a particular site requires

detailed and simultaneously acquired information on solar and wind energy availability on time scales from minutes to hours over a period of at least a year. Such data sets are rare and even then they are seldom found to be representative. DOE

**N83-18054#** Pacific Northwest Lab., Richland, Wash.
**NEW PRIORITIES IN ENERGY-CONSERVATION RESEARCH AND DEVELOPMENT**
T. L. Willke, W. B. Ashton, W. J. Hopp, G. J. Hane, A. Liberman, and G. Strasser (Strasser Assoc., Inc.) Dec. 1981 22 p refs Presented at the 4th Intern. Conf. on Alternative Energy Sources, Miami Beach, Fla., 14 Dec. 1981
(Contract DE-AC06-76RL-01830)
(DE82-005988; PNL-SA-10072; CONF-811212-13) Avail: NTIS HC A02/MF A01

Information on various technologies which offer significant potential for energy conservation yet require applied research and development to achieve that potential are discussed. The scope and the methodology used to identify and screen energy conservation research and development (R and D) opportunities are discussed. Results of the R and D opportunities study are discussed, including a tabular summary of conservation potential and example R and D needs. General aspects of the new energy policy and its effects on the federal role in energy conservation are discussed. The potential effects of the new energy policy upon areas of applied R and D identified under previous criteria are illustrated and elements of the new federal role in energy conservation are summarized. DOE

**N83-18055#** Oak Ridge National Lab., Tenn. Metals and Ceramics Div.
**INVESTIGATION OF ATTIC-INSULATION EFFECTIVENESS USING ACTUAL ENERGY-CONSUMPTION DATA**
T. F. Scanlan, C. K. Bayne, and D. R. Johnson 1981 24 p Presented at the Energy Conserv. in the 80's Conf., Clearwater, Fla., 8 Dec. 1981
(Contract W-7405-eng-26)
(DE82-006822; CONF-811222-1) Avail: NTIS HC A02/MF A01

Investigators determined the effectiveness of attic insulation using actual energy consumption and weather data for 34 single family residences in the Knoxville, Tennessee area. For each residence, linear regression techniques were used to determine the actual winter energy consumption rates for 2 years before and 3 years after the installation of attic insulation. Comparison of the pre and post installation energy consumption rates confirmed, in all but a few cases, the effectiveness of attic insulation. The agreement between predicted and actual consumption rates is also addressed. DOE

**N83-18056#** Oak Ridge National Lab., Tenn.
**APPLICATION OF LASER ANNEALING AND LASER-INDUCED DIFFUSION TO PHOTOVOLTAIC CONVERSION**
R. T. Young, G. A. vanderLeeden, and R. F. Wood 10 Dec. 1981 21 p refs Presented at the SERI Polycryst. Silicon Solar Cells Topical Rev. on High Efficiency, Washington, D.C., 10 Dec. 1981
(Contract W-7405-eng-26)
(DE82-006792; CONF-811224-1) Avail: NTIS HC A02/MF A01

High efficiency silicon solar cells can be fabricated by ion implantation followed by pulsed laser annealing. The proper choice of implantation parameters (energy and dose), laser energy density, substrate temperature, and the improvement of the minority carrier diffusion length of the starting material are important factors in obtaining high efficiency cells. Recently, it was shown that substrate heating during pulsed laser annealing can improve the electrical properties of the emitter regions of solar cells. It was found that the open circuit voltage and the fill factor of ion implanted, laser-annealed cells can be improved by increasing the emitter dopant concentration, whereas the short circuit current remains fairly constant; these results are in only qualitative agreement with theoretical predictions. Single crystal Si solar cells with efficiencies of over 16% were obtained. DOE

**N83-18057#** Pacific Northwest Lab., Richland, Wash.
**CATALYST BEHAVIOR IN BIOMASS GASIFICATION**
S. L. Weber, L. J. Sealock, Jr., L. K. Mudge, D. H. Mitchell, and R. J. Robertus 1981 31 p ref Presented at the 90th AIChE Natl. Meeting, Houston, Tex., 5-9 Apr. 1981
(Contract DE-AC06-76RL-01830)
(DE82-006164; PNL-SA-9063; CONF-810417-10) Avail: NTIS HC A03/MF A01

Conversion of biomass to specific products by steam gasification in the presence of catalysts is the subject of investigations conducted to determine the technical feasibility of catalytic processes for wood gasification to specific products and to evaluate the economic feasibility of the technically feasible processes. Studies focused on producing a methane rich gas and a 2:1 H2 to CO ratio synthesis gas suitable for hydrocarbon or methanol production via conventional methods. Specific catalysts employed and their behavior for each gasification scheme are discussed. DOE

**N83-18058#** Pacific Northwest Lab., Richland, Wash.
**CATALYTIC GASIFICATION OF BIOMASS**
R. J. Robertus, L. K. Mudge, L. J. Sealock, Jr., D. H. Mitchell, and S. L. Weber 1981 26 p refs Presented at the Spring Meeting of the Western States Sect. of the Combustion Inst., Pullman, Wash., 13-14 Apr. 1981
(Contract DE-AC06-76RL-01830)
(DE82-005877; PNL-SA-9173; CONF-810466-4) Avail: NTIS HC A03/MF A01

Methane and methanol synthesis gas can be produced by steam gasification of biomass in the presence of appropriate catalysts. This concept is to use catalysts in a fluidized bed reactor which is heated indirectly. The objective is to determine the technical and economic feasibility of the concept. Technically the concept has been demonstrated on a 50 lb per hr scale. Potential advantages over conventional processes include: no oxygen plant is needed, little tar is produced so gas and water treatment are simplified, and yields and efficiencies are greater than obtained by conventional gasification. Economic studies for a plant processing 2000 T/per day dry wood show that the cost of methanol from wood by catalytic gasification is competitive with the current price of methanol. Similar studies show the cost of methane from wood is competitive with projected future costs of synthetic natural gas. When the plant capacity is decreased to 200 T per day dry wood, neither product is very attractive in today's market. DOE

**N83-18059#** Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
**EFFECTS OF GRAIN BOUNDARIES IN GaAs SOLAR CELLS**
John P. Benner and A. Eugene Blakeslee Dec. 1981 13 p refs Presented at the Mater. Res. Soc. Meeting, Boston, 16-19 Nov. 1981
(Contracts DE-AC02-77CH-00178; EG-77-C-01-4042)
(DE82-006118; SERI/TP-212-1493; CONF-811122-48) Avail: NTIS HC A02/MF A01

Many problems exist in current attempts to develop polycrystalline GaAs as a basis for thin-film solar cells. Some of these problems arise from the direct interaction of carriers, both dark and photo-generated, with grain boundaries. Others are more indirect; e.g., shunting currents due to the grain boundary-enhanced diffusion of contaminating impurities. Several of these effects are described, including the influence of system chemistry on grain properties, the correlation of device parameters with grain size, and grain boundary passivation experiments. A review of various approaches to solving the problems confronting the field is given, and an attempt is made to interpret observations in terms of existing theoretical models. DOE

**N83-18060#** Argonne National Lab., Ill. Academy for Contemporary Problems.
**THE COMPREHENSIVE COMMUNITY ENERGY MANAGEMENT PROGRAM: AN EVALUATION**
J. L. Moore, D. A. Berger, H. M. Griggs, and C. B. Rubin Dec. 1981 374 p

(Contract W-31-109-eng-38)
(DE82-011552; ANL/CNSV-TM-89) Avail: NTIS HC A16/MF A01

A comprehensive community energy management program (CCEMP) in communities was developed to facilitate comprehensive community energy management through dissemination of methodologies and the results of applying these methodologies. Information for federal policy related to CCEMP was also developed. A synthesis of insights gained from the community experiences is provided. Approaches and topics in evaluating the pilot program, and the background and methodology of community energy planning are discussed. The factors contributing to different plant outcomes, providing an overall synthesis and program evaluation are examined. Detailed action plans for ten cities, three counties, and three regions are given. DOE

**N83-18061#** Brookhaven National Lab., Upton, N. Y. Biomedical and Environmental Assessment Div.
**MODEL SIMPLIFICATION TO EXAMINE THE INTERRELATIONSHIPS BETWEEN COAL, GAS AND OIL USE**
H. C. Thode, Jr., A. S. Kydes, and S. J. Finch 1981 21 p refs Presented at the CORS-TIMS-ORSA Joint Natl. Meeting, Toronto, Canada, 3-6 May 1981
(Contract DE-AC02-76CH-00016)
(DE82-007816; BNL-30741; CONF-810542-6) Avail: NTIS HC A02/MF A01

The Brookhaven Energy System Optimization Model (BESOM) is used to develop a simplified model for investigating the inter-relationships between coal, gas, and imported oil use in the USA using the pseudo-data approach and exploratory data analysis. This simplified model is tested by predicting the imported oil needed for levels of coal and gas use consistent with the restrictions of BESOM. Predictions of the derived functions were verified with full-scale BESOM runs. DOE

**N83-18062#** Sandia Labs., Albuquerque, N. Mex. Central Receiver Test Facility.
**SOLAR FURNACE FOR FLUX GAGE CALIBRATION AND THERMAL-EFFECTS TESTING**
R. M. Edgar, E. H. Richards, and G. P. Mulholland (New Mexico State Univ., Las Cruces) 1981 18 p Presented at the Solar Thermal Test Facility Users Assoc. Meeting, Albuquerque, N. Mex., 26 Oct. 1981
(Contract DE-AC04-76DP-00789)
(DE82-005769; SAND-81-1776C; CONF-8110154-1) Avail: NTIS HC A02/MF A01

A solar furnace to calculate gauge flux and thermal effects was studied. The solar furnace consists of a 7.4 m square heliostat, a 6.7 m diameter concentrator, an attenuator designed to vary the flux density at the test area, and a three axis positioning table at the test area. Its primary function is the calibration of flux gages but other tasks and/or experiments will be considered as time permits. DOE

**N83-18063#** Institute of Gas Technology, Chicago, Ill.
**HIGH-TEMPERATURE COMPOSITE LATENT/SENSIBLE HEAT STORAGE**
T. D. Claar and R. J. Petri 1981 7 p refs Presented at the Ann. Contractors' Rev. Meeting on Thermal and Chem. Storage, Tysons Corner, Va., 16 Sep. 1981
(Contract DE-AC02-77CH-00178)
(DE82-010396; CONF-810940-29) Avail: NTIS HC A02/MF A01

A composite latent/sensible media concept was evaluated for technical and economic feasibility of satisfying high-temperature solar thermal energy storage requirements. The approaches taken to identify and resolve critical technical issues associated with this advanced TES concept are discussed. DOE

**N83-18064#** Geothermal Development Associates, Reno, Nev.
**A PRELIMINARY PLAN FOR THE DEVELOPMENT OF GEOTHERMAL ENERGY IN THE TOWN OF GABBS, NEVADA**
9 Nov. 1981 111 p refs
(Contract DE-FC03-80RA-50075)
(DE82-007602; DOE/RA-50075/T5) Avail: NTIS HC A06/MF A01

Characteristics of the site significant to the prospect for geothermal development are described. These characteristics include physiography, demography, economy, and the goals and objectives of the citizens as they would relate to geothermal development. The geothermal resource evaluation is described. The reservoir is described in general defining the depth to the reservoir, production rates of the existing water wells, water quality, and the resource temperature. Uses of the energy that seem appropriate to the situation both now and in the foreseeable future consumed, by end-user, are estimated. A conceptual engineering design and cost estimates are presented. The results of a life cycle analysis of the economic feasibility are discussed. The essential institutional requirements for geothermal energy development are discussed. DOE

**N83-18065#** Geothermal Development Associates, Reno, Nev.
**A PRELIMINARY PLAN FOR THE DEVELOPMENT OF GEOTHERMAL ENERGY IN THE TOWN OF HAWTHORNE, NEVADA**
4 Nov. 1981 123 p refs
(Contract DE-FC03-80RA-50075)
(DE82-007594; DOE/RA-50075/T6) Avail: NTIS HC A06/MF A01

The development of the geothermal resource were analyzed. Site characteristics pertinent to the geothermal development are described. The probable drilling depth to the reservoir, anticipated water production rates, water quality, and resource temperatures are indicated. Uses of the energy appropriate to the situation are described. The amounts and types of energy currently consumed by end users are estimated. Conceptual engineering designs and cost estimates for three alternative district heating systems are presented. The results of a life cycle cost analysis for these alternatives are discussed. The essential institutional requirements for geothermal energy development, including the financial, environmental, and legal and regulatory aspects are discussed. The various steps necessary to accomplish the construction of the geothermal district heating system at Hawthorne are described. DOE

**N83-18066#** Lahontan, Inc., Sacramento, Calif. Alternate Energy Systems Dept.
**GEOTHERMAL ENERGY: OPPORTUNITIES FOR CALIFORNIA COMMERCE, PHASE 1 REPORT**
Peter Klaussen and Philip Edwardes Jan. 1982 117 p refs Sponsored in part by the California Energy Commission
(Contract DE-FC03-79ET-27135)
(DE82-009121; DOE/ET-27135/T1) Avail: NTIS HC A06/MF A01

California's geographic and end use markets which could directly use low and moderate temperature geothermal resources are ranked and described, as well as those which have the highest potential for near term commercial development of these resources. Out of 38 geothermal resource areas with characteristics for direct use development, five areas have no perceived impediments to near term development. Twenty-nine applications were compared with previously selected criteria to determine their near term potential for direct use of geothermal fluids. Seven categories were found to have the least impediments to development; agriculture and district heating applications are considered the highest. Ten year projections were conducted for fossil fuel displacement from the higher rated applications. It is concluded that greenhouses have the greatest displacement of 18 x 10 to the 6th power therms per year. DOE

**N83-18067#** Pacific Northwest Lab., Richland, Wash.
**COMMERCIAL BUILDING DESIGN AND ENERGY CONSERVATION: A PRELIMINARY ASSESSMENT**
A. L. Nieves and D. Rosoff Feb. 1982 13 p Presented at the 9th Energy Technol. Conf., Washington, 16 Feb. 1982
(Contract DE-AC06-76RL-01830)
(DE82-008581; PNL-SA-10230; CONF-820217-2) Avail: NTIS

HC A02/MF A01

The purpose of the research was to determine the degree of change in commercial building design practice relating to energy conservation since the enactment of the Energy Conservation Standard for New Buildings Act of 1976. Data on current design practices consisted of information from 400 buildings advertised for bids or under construction in 1979 to 1980 on glass in windows and doors, exterior wall systems, roof system, heating plants, and lighting systems. In addition to these building design components, energy conservation measures used included: natural lighting; deadband thermostat; greenhouse-effect atrium collector, heat recovery from the top of the atrium, greenhouse passive heating panels; natural ventilation; insulating shutters, closable skylights, thermal shutters, Trombe wall, corridor trombe; attic ventilation; wind shielding, concrete wall; titled windows; night flushing cycle; and cooling coils using cooling tower water. A brief explanation of these measures is given. DOE

**N83-18068#** Southern Solar Energy Center, Inc., Atlanta, Ga.
**ENERGY CONSIDERATIONS: MOBILE HOMES IN THE SOUTH**
Gary R. Tilt Nov. 1981 22 p refs
(Contract DE-AC02-79CS-30166)
(DE82-009586; SSEC/SP-32288) Avail: NTIS HC A02/MF A01

Mobile homes in the Southern region are discussed and their relationship to residential energy conservation is examined. Research being done in energy conservation and solar energy applications for manufactured houses is examined. A bibliography is included. DOE

**N83-18069#** Oak Ridge National Lab., Tenn. Efficiency and Renewables Research Section.
**STARTUP EXPERIENCE WITH A CONCENTRATING PHOTOVOLTAIC POWER SYSTEM**
S. I. Kaplan 1982 16 p refs Presented at the 20th Aerospace Sci. Conf., Orlando, Fla., 11-14 Jan. 1982
(Contract W-7405-eng-26)
(DE82-008833; CONF-820106-6) Avail: NTIS HC A02/MF A01

The startup testing of a solar photovoltaic power system located at Mississippi County Community College, Blytheville, Arkansas is examined. A review of problems encountered and methods of investigation are included, as well as assessments of the underlying causes and remedial action accomplished. The observed power output capacity and plausible levels of future improvement are also discussed. DOE

**N83-18070#** Gruy Federal, Inc., Arlington, Va.
**MULTIPLE-TASK SERVICES FOR THE DIVISION OF GEOTHERMAL ENERGY'S HYDROTHERMAL-RESOURCES PROGRAM Annual Report, Nov. 1980 - Oct. 1981**
Jan. 1982 17 p
(Contract DE-AC08-81NV-10177)
(DE82-009007; DOE/NV-10177/1) Avail: NTIS HC A02/MF A01

Activities and tasks regarding geothermal resources are listed. The tasks involve resource definition and technical assistance. DOE

**N83-18071#** Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
**THE ENERGY OF THE OCEAN THERMAL RESOURCE AND THE SECOND-LAW EFFICIENCY OF IDEALIZED OCEAN THERMAL ENERGY CONVERSION POWER CYCLES**
David H. Johnson Sep. 1982 38 p refs Revised
(Contract DE-AC02-77CH-00178)
(DE83-000449; SERI/TR-252-1420R-Rev) Avail: NTIS HC A03/MF A01

A formula is developed to compute the maximum amount of work which can be extracted from a given combined mass of warm and cold ocean water (a quantity called the energy of the ocean thermal resources). Second it compares the second-law efficiencies of various proposed ocean thermal energy conversion power cycles to determine which best utilizes the energy of the ocean thermal resource. The second-law efficiencies of the multicomponent working fluid cycle, the Beck cycle, and the open and closed single- and multiple-stage Rankine cycles are compared. These types of OTEC power plants are analyzed in a consistent manner which assumes that all deviations from a plant making use of all the energy (one with a second-law efficiency of 100%) occurs because of irreversible transfer of heat across a finite temperature difference. Conversion of thermal energy to other forms is assumed to occur reversibly. The comparison of second-law efficiencies of various OTEC power cycles shows that the multistage Rankine open cycle with just three stages has the potential of best using the energy of the ocean thermal resource. DOE

**N83-18072#** McDonnell-Douglas Astronautics Co., Huntington Beach, Calif.
**SOLAR-COLLECTOR MATERIALS EXPOSURE TO THE IPH SITE ENVIRONMENT. TASK 5.0 Final Report**
V. L. Morris Jul. 1982 68 p refs
(Contract DE-AC04-76DP-00789)
(DE83-002192; SAND-81-7029) Avail: NTIS HC A04/MF A01

An environmental exposure test was conducted at a site which utilizes solar energy for enhanced oil recovery procedures. Two types of reflector materials were evaluated for survivability in this environment: second surface silvered glass and aluminized acrylic (FEK-244) on an aluminum substrate. Black chrome absorber material and low iron float glass were evaluated for thermal, photochemical and environmental degradation. The reflector specimens were monitored for decreases in specular and hemispherical reflectance due to soil buildup. The absorber material is evaluated for changes in solar absorptivity and emissivity and the glass cover plates is evaluated for changes in transmissivity. DOE

**N83-18073#** Geological Survey, Denver, Colo.
**GEOTHERMAL RESOURCE ASSESSMENT OF IDAHO SPRINGS, COLORADO. RESOURCE SERIES 16**
Frank N. Repplier, Ted G. Zacharakis, and Charles D. Ringrose 1982 56 p refs
(Contract DE-AS07-77ET-28365)
(DE83-000345; DOE/ET-28365/17) Avail: NTIS HC A04/MF A01

Geothermal springs and wells were assessed for hydrothermal conditions. The temperature of these waters ranges from a low of 680 F to a high of 1270 F. The hydrothermal conditions of the Idaho Springs region in 1980 were defined by electrical geophysical, soil mercury geochemical, and reconnaissance geological and hydrogeological surveys. The investigation was limited to the immediate area surrounding the thermal springs at the Indian Springs Resort. It is found that bedrock of the region is faulted and fractured metamorphosed Precambrian gneisses and schists, locally intruded by Tertiary age plutons and dikes. It is shown that the thermal waters most likely are fault controlled and the thermal area does not have a large areal extent. DOE

**N83-18074#** Sargent and Lundy, Engineers, Chicago, Ill.
**COMPRESSED-AIR ENERGY STORAGE: PRELIMINARY DESIGN AND SITE-DEVELOPMENT PROGRAM IN AN AQUIFER. VOLUME 3: SITE-SELECTION STUDY, PART 2 Final Report**
Sep. 1982 347 p refs Prepared in cooperation with Public Service Co. of Indiana Sponsored by EPRI
(Contracts DE-AC02-78ET-29232; ET-78-C-01-2159; EPRI Proj. 1081-3)
(DE83-001252; EPRI-EM-2351-Vol-3-Pt-2) Avail: NTIS HC A15/MF A01

The behavior and suitability of an aquifer based compressed air energy storage (CAES) facility was investigated. Aspects of the site selection were studied. Aquifer sites in the Illinois and Indiana portions of the Illinois Basin were identified and ranked. A site was selected from the four top ranked sites and was utilized as the host site for the preliminary design of a compressed air energy storage facility. DOE

**N83-18075#** Argonne National Lab., Ill. Energy from Municipal Waste Program.
**METHANE FROM LANDFILLS: PRELIMINARY ASSESSMENT**

**WORKBOOK**
Michael L. Wilkey, R. Eric Zimmerman, and H. Ron Isaacson (ESCOR, Inc.) Jun. 1982 30 p
(Contract W-31-109-eng-38)
(DE83-002319; ANL/CNSV-31) Avail: NTIS HC A03/MF A01

System options for developing landfill gas recovery projects are discussed. Factors effecting the economics of each option are reported. Sample calculations and worksheets are included to assist in the process of making preliminary judgments about production and revenue potentials for landfill gas recovery at a specific site. DOE

**N83-18076#** Los Alamos Scientific Lab., N. Mex.
**ENERGY DEVELOPMENT ON NATIVE AMERICAN LANDS: RESOURCES AND ATTITUDES. AN INTERPRETIVE REPORT ON TWO MAJOR INDIAN CONFERENCES OF 1980**
Frank J. Lucero, Jr. Feb. 1982 34 p refs
(Contract W-7405-eng-36)
(DE82-009539; LA-9218-MS) Avail: NTIS HC A03/MF A01

Energy resources (oil, gas, coal, uranium) on Indian lands are assessed and an analysis of Indian attitudes toward energy development on their land is made. An examination is made of how Indians think their governments ought to operate; specific Indian religious and social attitudes towards energy development are explored. Current litigation in taxation, Federal regulation of Indian mineral development, Federal environmental standards, and Indian water-rights disputes are discussed. DOE

**N83-18077#** Southern Solar Energy Center, Inc., Atlanta, Ga.
**DEVELOPMENT OF RESIDENTIAL-CONSERVATION-SURVEY METHODOLOGY FOR THE US AIR FORCE. TASK 2 Interim Report**
D. W. Abrams, T. L. Hartman, and A. S. Lau 13 Nov. 1981 132 p
(Contract DE-AC02-79CS-30166)
(DE82-009473; SSEC/TP-412832) Avail: NTIS HC A07/MF A01

A residential energy conservation methodology was developed to compare USAF needs and procedures of the residential conservation service (RCS) program developed by utility companies for serving civilian customers. Attention was given to the data implications related to group housing, climatic data requirements, life cycle cost analysis, energy saving modifications beyond those covered by RCS, and methods for utilizing existing energy consumption data in approaching the USAF survey program. The five subtasks of the program are summarized. Energy conservation alternatives are listed and the basic analysis techniques for evaluating thermal performance are described. DOE

**N83-18078#** Sandia Labs., Albuquerque, N. Mex.
**PROJECT DEEP STEAM Quarterly Report, 1 Jan. - 31 Mar. 1981**
D. P. Aeschliman, R. G. Clay, A. B. Donaldson, S. W. Eisenhawer, R. L. Fox, D. R. Johnson, and A. J. Mulac Jan. 1982 22 p
(Contract DE-AC04-76DP-00789)
(DE82-010945; SAND-81-2203) Avail: NTIS HC A02/MF A01

The objective of Project DEEP STEAM is to develop the technology to economically produce heavy oils from deep reservoirs. The tasks included in this project are the development of thermally efficient delivery systems and downhole steam generation systems. During the period January 1-March 31, 1981, effort has continued on a low pressure combustion downhole generator (Rocketdyne), and on two high pressure designs (Foster-Miller Associates, Sandia National Laboratories). The Sandia design was prepared for deployment in the Wilmington Field at Long Beach, California. Progress continued on the Min-Stress II packer concept at L'Garde, Inc., and on the extruded metal packer at Foster-Miller. Initial bare string field data are reported on the insulated tubular test at Lloydminster, Saskatchewan, Canada. DOE

**N83-18079#** Oak Ridge National Lab., Tenn. Engineering Physics Div.
**EVALUATION OF THE MATHEMATICAL AND ECONOMIC BASIS FOR CONVERSION PROCESSES IN THE LEAP ENERGY-ECONOMY MODEL**
E. M. Oblow Oct. 1982 31 p refs
(Contract W-7405-eng-26)
(DE83-001706; ORNL/TM-8178) Avail: NTIS HC A03/MF A01

An evaluation was made of the mathematical and economic basis for conversion processes in the Long-term Energy Analysis Program (LEAP) energy economy model. Conversion processes are the main modeling subunit in LEAP used to represent energy conversion industries and are supposedly based on the classical economic theory of the firm. Questions about uniqueness and existence of LEAP solutions and their relation to classical equilibrium economic theory prompted the study. An analysis of classical theory and LEAP model equations was made to determine their exact relationship. The conclusions drawn from this analysis were that LEAP theory is not consistent with the classical theory of the firm. Specifically, the capacity factor formalism used by LEAP does not support a classical interpretation in terms of a technological production function for energy conversion processes. The economic implications of this inconsistency are suboptimal process operation and short term negative profits in years where plant operation should be terminated. A new capacity factor formalism, which retains the behavioral features of the original model, is proposed to resolve these discrepancies. DOE

**N83-18080#** Los Alamos Scientific Lab., N. Mex.
**ENERGY SUPPLY AND DEMAND IN THE CARIBBEAN REGION, 1978-2000**
Christopher J. Ruhm (California Univ.) Sep. 1982 65 p refs
(Contract W-7405-eng-36)
(DE83-002312; LA-9526-MS) Avail: NTIS HC A04/MF A01

Energy demand for countries in and bordering the Caribbean Ocean through the year 2000 is estimated. Forecasts, on a country by country basis, are formed using estimates for the gross domestic product growth rates, petroleum price increases, and income and price elasticities. Energy demand is generally concluded to rise during the forecast period, even with greater conservation efforts, but at a slower rate than in the past. The costs of imported energy are projected to increase faster than national incomes and in some cases may seriously adversely affect prospects for economic development. Energy demands are further projected on a sector by sector basis for Central American nations. These forecasts are consistent with results of the aggregated projections and indicate that for these countries, major efforts should be devoted towards reducing the transportation sector's demand for energy. DOE

**N83-18081#** California Univ., Livermore. Lawrence Livermore Lab. Energy and Resource Planning Group.
**US ENERGY FLOW, 1981**
C. K. Briggs and I. Y. Borg 1 Oct. 1982 19 p refs
(Contract W-7405-eng-48)
(DE83-001579; UCID-19227-81) Avail: NTIS HC A02/MF A01

Flow diagrams to describe the US energy situation are given. In 1981 the energy consumption was 73 quads (or 73 times 10 to the 15th power Btu). Use was down from 75 quads in 1980. Oil continues to dominate the picture as it comprises 45% of the total energy used. Net oil use (exclusive of oil purchased for the Strategic Petroleum Reserve and Exports) fell 8%; oil imports declined 14%. In contrast to oil, use of natural gas and coal remained at 1980 levels. Decreased use of residual oils, principally for electric power generating, account for much of the drop in oil use. Increased use of coal and nuclear energy for power generation almost compensated for the decrease in use of oil in that end use. Transmitted power remained at 1980 levels. The remainder of the drop in energy usage is attributed to price driven conservation, increased efficiencies in end use and the recession that prevailed during most of the year. The share of the energy drop attributable to the recession is estimated by various analysts to be on the order of 40 to 50%. DOE

**N83-18082#** Oak Ridge National Lab., Tenn.
**FOSSIL ENERGY PROGRAM Progress Report, Oct. 1981**
L. E. McNeese Dec. 1981 95 p refs

(Contract W-7405-eng-26)
(DE82-007496; ORNL/TM-8116) Avail: NTIS HC A05/MF A01

Research and development programs in support of the increased utilization of coal and other fossil fuel alternatives as sources of clean energy are reported. The following projects are reported: coal conversion development, chemical research and development, materials technology, component development and process evaluation, technical support to major liquefaction, process analysis and engineering evaluations, fossil energy environmental analysis, environmental control technology, coal preparation waste utilization, atmospheric fluidized bed coal combustor for cogeneration, TVA FBC demonstration plant program technical support, PFBC systems analysis, FBC char utilization improvement, fossil fuel applications assessments, performance assurance system support for fossil energy projects, international energy technology, generalized equilibrium models for liquid and gaseous fuel supplies, analysis of coal production, and fossil energy information center. DOE

**N83-18083#** Oak Ridge National Lab., Tenn.
**FOSSIL-ENERGY PROGRAM Progress Report, Nov. 1981**
L. E. McNeese Jan. 1982 91 p
(Contract W-7405-eng-26)
(DE82-007502; ORNL/TM-8153) Avail: NTIS HC A05/MF A01

The increased utilization of coal and other fossil fuel alternatives as sources of clean energy is reported. The projects reported include: coal conversion development, chemical research and development, materials technology, component development and process evaluation, technical support to major liquefaction, process analysis and engineering evaluations, fossil energy environmental analysis, environmental control technology, coal preparation waste utilization, atmospheric fluidized bed coal combustor for cogeneration, TVA FBC demonstration plant program technical support, PFBC systems analysis, FBC char utilization improvement, fossil fuel applications assessments, performance assurance system support for fossil energy projects, international energy technology, generalized equilibrium models for liquid and gaseous fuel supplies, instrumentations and controls and fossil energy information center. DOE

**N83-18084#** Westinghouse Electric Corp., Pittsburgh, Pa. Research and Development Center.
**EVALUATION OF GASIFICATION AND GAS-CLEANUP PROCESSES FOR USE IN MOLTEN-CARBONATE FUEL-CELL POWER PLANTS Quarterly Technical Progress Report, Oct. - Dec. 1981**
1981 53 p refs
(Contract DE-AC21-81MC-16220)
(DE82-012244; DOE/MC-16220/T3; QTPR-3) Avail: NTIS HC A04/MF A01

A choice of the gasifier/cleanup system combinations most suitable for molten carbonate fuel cell based power plant application is discussed. Included are hot gas cleanup, air blown, oxygen blown and molten salt based coal gas supply systems. An assessment of deposition for power plant size molten carbonate fuel cells is given and mechanisms affecting particle transfer in fuel cells are described. Gas cleanup to remove virtually all particles larger than one micron in diameter is expected to prevent, or at least minimize to a negligibly low level, deposition of particulate material on the anode. However, cathode particulate deposition in molten carbonate fuel cells should be evaluated in the future, since cathodes are more likely to experience deposition even though cathode channel particle concentrations can be much lower than anode channel concentrations. Cathodes are more susceptible to deposition than anodes due to a net mass flow of gases into cathode pores compared to a net mass flow of gases out from anode pores. DOE

**N83-18085#** Oak Ridge National Lab., Tenn.
**ADVANCED RESEARCH AND TECHNOLOGY DEVELOPMENT FOSSIL ENERGY MATERIALS PROGRAM Quarterly Progress Report for period ending 30 Sep. 1981**
R. A. Bradley, comp. Dec. 1981 411 p refs
(Contract W-7405-eng-26)
(DE82-007121; ORNL/FMP-81/4; QPR-4) Avail: NTIS HC A18/MF A01

Research and development on materials for fossil energy applications with a focus on the longer-term and generic needs of the various fossil fuel technologies is discussed. Research aimed toward a better understanding of materials behavior in fossil energy environments and the development of new materials capable of substantial enhancement of plant operations and reliability is discussed. Coal gasification, coal liquefaction, pressure vessel materials, and heat exchangers are discussed. DOE

**N83-17460#** Federal Aviation Administration, Washington, D.C. Energy Div.
**AN OVERVIEW OF THE DOT/FAA AVIATION ENERGY CONSERVATION POLICY**
Charles J. Hoch *In* DOE Symp. on Com. Aviation Energy Conserv. Strategies Apr. 1981 p 79-94 (For primary document see N83-17455 08-01)
Avail: NTIS HC A17/MF A01 CSCL 01/2

**N83-17475#** Technische Hogeschool, Delft (Netherlands). Dept. of Aerospace Engineering.
**AERODYNAMIC RESEARCH ON TIPVANE WINDTURBINES**
G. J. W. vanBussel, Th. vanHolten, and G. A. M. vanKuik *In* AGARD Prediction of Aerodyn. Loads on Rotorcraft Sep. 1982 13 p refs (For primary document see N83-17470 08-01)
Avail: NTIS HC A14/MF A01

**N83-17476#** Aeritalia S.p.A., Torino (Italy). Energy Sector.
**AERODYNAMIC LOAD CALCULATION OF HORIZONTAL AXIS WIND TURBINE IN NON-UNIFORM FLOW**
Elio Lupo *In* AGARD Prediction of Aerodyn. Loads on Rotorcraft Sep. 1982 10 p refs (For primary document see N83-17470 08-01)
Avail: NTIS HC A14/MF A01

**N83-17765#** Joint Publications Research Service, Arlington, Va.
**FIRST RESULTS, PROBLEMS OF FRENCH DEEP GASIFICATION PROGRAM**
Pierre Gaussens *In its* West Europe Rept.: Sci. and Technol., No. 134 (JPRS-82686) 20 Jan. 1983 p 49-61 Transl. into ENGLISH from L'Ind. du Petrole Gaz-Chim. (France), Oct. 1982 p 46-52 (For primary document see N83-17761 08-31)
Avail: NTIS HC A05/MF A01

# 45 ENVIRONMENT POLLUTION

Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

**N83-18086** Netherlands Organization for Applied Scientific Research TNO, Delft. Div. of Technology for Society.
**TURBULENT DIFFUSIVITIES AND DISPERSION COEFFICIENTS: APPLICATION TO CALM WIND CONDITIONS**
P. J. H. Builtjes Jan. 1982 19 p refs Presented at 15th Intern. Symp. on Atmospheric Pollution, Paris, 4-7 May 1982
(TNO-82-0348) Avail: Issuing Activity

Based on theoretical considerations and experimental data some remarks are made about the relationship between dispersion coefficients, sigma parameters, and turbulent diffusivities, K parameters. Special attention is given to the behavior of these parameters at calm wind conditions and their use in existing calm wind dispersion models. Author

**N83-18087#** Committee on Foreign Relations (U. S. Senate).
**ACID RAIN**
Washington GPO 1982 171 p refs Hearing before the Subcomm. on Arms Control, Oceans, Intern. Operations and Environ. of the Comm. on Foreign Relations, 97th Congr., 2d Sess., 10 Feb. 1982
(GPO-92-838) Avail: Subcommittee on Arms Control, Oceans,

International Operations and Environment
Various ramifications of acid rain are addressed. N.W.

**N83-18088#** Finnish Meteorological Inst., Helsinki.
**AIR QUALITY AT FINNISH BACKGROUND STATIONS IN THE 1970'S**
Antti Kulmala, Alec Estlander, Liisa Leinonen, Tuija Ruoho-Airola, and Tapani Saeynaetkari 1982 159 p refs In FINNISH; ENGLISH summary
(Rept-36) Avail: NTIS HC A08/MF A01

Air quality was observed at Finnish background stations. Reference data is used for urban research and studies of the long range transport of air pollutants and their effects. Concentration and deposition data from background stations is presented. The data is based on one national and two international measurement programs. Sulfur compounds were emphasized but the deposition and suspended particulates were studied for other components as well. The sampling time was one day in long range transport research and a week or a month in the other programs. Sampling and analysis methods are described and an estimate of the reliability of the results is presented. S.L.

**N83-18089*#** National Aeronautics and Space Administration. Pasadena Office, Calif.
**PARTICLE ANALYZING METHOD AND APPARATUS Patent Application**
Mahadeva P. Sinha (JPL, California Inst. of Tech., Pasadena), Charles E. Giffin (JPL, California Inst. of Tech., Pasadena), David D. Norris (JPL, California Inst. of Tech., Pasadena), and Sheldon K. Friedlander, inventors (to NASA) (JPL, California Inst. of Tech., Pasadena) Filed 17 Nov. 1980 13 p Sponsored by NASA
(NASA-Case-NPO-15292-1; NASA-Case-NPO-15308-1; US-Patent-Appl-SN-207135) Avail: NTIS HC A02/MF A01 CSCL 13B

A device for indicating the composition of airborne particles such as those that pollute the air is described. The air containing particles to be analyzed, is drawn through a small diameter tube into a vacuum chamber. The individual particles pass in a straight line through the chamber and into skimmer opening. Few of the air molecules pass through the opening, but instead diffuse into other areas of the chamber. Each particle moving in free flight is detected by its scattering of a laser beam onto a photodetector. Then, a powerful laser pulse vaporizes and ionizes the particle. The ions from the particle are detected by a mass spectrometer. One novel feature is the moving of individual particles in free flight past a vaporizing and ionizing apparatus. NASA

**N83-18090#** Royal Netherlands Meteorological Inst., De Bilt.
**CHEMICAL COMPOSITION OF PRECIPITATION OVER THE NETHERLANDS Annual Report, 1981**
T. B. Bidder and H. F. R. Reijnders 1981 50 p refs Prepared in cooperation with Rijksinst. voor de Volksgezonheid
(KNMI-156-4; RIV-217810005) Avail: NTIS HC A03/MF A01

The chemical composition of precipitation over the Netherlands over 1981 was determined, using monthly samples from a 13 station network. Sampling and analytical procedures for the main components are described. Seasonal and annual averages and 4 year averages for the period 1978-1981 are given. Seasonal, annual and 4 year averages of 14 components are depicted in maps, showing some isolines. Inorganic and organic microcomponents, respectively, sampling and analytical procedures for these components. The data for natural isotopes in monthly samples are included. E.A.K.

**N83-18091#** Centre National de la Recherche Scientifique, Orleans (France). Lab. de Physique et Chimie de l'Environment.
**[ACTIVITIES REPORT IN SPATIAL PLASMA PHYSICS, ATMOSPHERIC PHYSICOCHEMISTRY AND THEORETICAL PHYSICS APPLIED IN SPACE ENVIRONMENTS] Annual Report, 1 Jan. 1981 - 1 Apr. 1982 [RAPPORT D'ACTIVITE DU 1 JANVIER 1981 AU 1 AVRIL 1982]**
May 1982 77 p refs In FRENCH
(LPCE-NT-1) Avail: NTIS HC A05/MF A01

Experimental techniques and methods used to measure dynamic frontiers and phenomena are described including the ISOPROBE experiment for the AUREOL/ARCAD 3 satellite and the mutual impedance sonde for diagnosing cold plasmas being prepared for the Swedish VIKING satellite to be launched in 1984. Results obtained for studies of equatorial regions, ionosphere-magnetosphere coupling, and particle acceleration in auroral zones are interpreted as well as preliminary results from the ISOPROBE/ARCAD 3 experiment. Ongoing studies of the ionosphere and magnetosphere are summarized as are investigations of waves and signal processing. In situ measurement of the Venus atmosphere and of volcanic gas composition is described. Group theory and nonlinear physics is covered as is the simulation of problems with an N body. Transl. by A.R.H.

**N83-18092#** Stockholm Univ. (Sweden). Dept. of Meteorology.
***ON THE DIFFERENCE IN CHEMICAL COMPOSITION OF PRECIPITATION COLLECTED IN BULK AND WET ONLY COLLECTORS***
Rolf Soederlund 18 Jun. 1982 23 p refs
(Contracts NFR-3922-110; SNV-641-3082-81-Fp; SNV-641-3511-80-Fp)
(CM-57; ISSN-0280-445X) Avail: NTIS HC A02/MF A01

Bulk and wet only collectors precipitation chemistry network were compared. It is found that the average, bulk collectors gave higher concentrations: 35% for calcium, 11% for ammonium, 4.5% for sulphate and 1.7% for nitrate. No difference was observed for hydrogen ion concentration (calculated from pH) and for amount of precipitation. The differences could be several times higher at sites with large local sources of contaminants. E.A.K.

**N83-18093#** Stockholm Univ. (Sweden). Dept. of Meteorology.
**AMMONIUM (NH4) (POSITIVE IONS) IN PRECIPITATION: A PRESENTATION OF DATA FROM THE EUROPEAN AIR CHEMISTRY NETWORK**
Rolf Soederlund and Lennart Granat 6 Sep. 1982 74 p refs
(Contracts NSR-G-GU-3922-103; NFR-G-UR-0223-110; SNV-641-3082-81-Fp; SNV-641-3511-80-Fp)
(CM-59; ISSN-0280-445X) Avail: NTIS HC A04/MF A01

The ammonium content of monthly precipitation samples collected in the European Air Chemistry Network (EACN) was evaluated for the period 1955 to 1979. A median two way table statistical analysis found a seasonal variation of the ammonium concentration with high concentration in November through February and low concentration in June through August. A slight increase in concentration, corresponding to an annual increase of about 1% per year. Transformations may have occurred more often during the early part of the operation of the network when higher pH values were more common than they are now. It is observed that biological growth is more frequent in samples with a high pH. E.A.K.

**N83-18094#** Technische Univ., Berlin (West Germany). Wirtschaftswissenschaftliche Dokumentation.
**DO EFFLUENT CHARGES (ALWAYS) REDUCE ENVIRONMENTAL DAMAGES**
Alfred Endres 1982 18 p refs
(Discussion-Paper-70) Avail: NTIS HC A02/MF A01

Effluent charges are discussed as a means for environmental quality. In a comparative static model, the long run adjustment of a perfectly competitive polluting firm to a change in the effluent charge rate is analyzed. The firm is assumed to have a flexible abatement technology. The firm may increase pollution when the charge rate is increased. Author

**N83-18095#** Fraunhofer-Inst. fuer Atmosphaerische Umweltforschung, Garmisch-Partenkirchen (West Germany).
**CLARIFICATION OF THE PHYSICAL AND CHEMICAL NATURE OF ULTRAFINE AEROSOLS, THEIR GENERATION DURING DIFFERENT INDUSTRIAL PROCESSES, AND THEIR RETENTION IN THE RESPIRATORY TRACT Final Report, Mar. 1981**
Reinhold Reiter, Karl Poetzl, and Hans-Joachim Kanter Bonn Bundesministerium fuer Forschung und Technologie Oct. 1982

90 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-HA-82-022; ISSN-0171-7618) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 19

The development of measuring techniques suitable for detecting particle spectra from > 10 to < 0.03 micro diameter particle size dependent sampling and the chemical aerosols matrix and retention in the sections of the respiratory tract were investigated. Ironworks considering enrichment of toxic heavy metals in ultrafine aerosols, specifically during thermal processes were studied. The wide spread occurrence of ultrafine aerosols and the expected heavy metal enrichments up to one order of magnitude are confirmed. E.A.K.

**N83-18096#** Gesellschaft fuer Elektrometallurgie m.b.H., Duesseldorf (West Germany). Werk Nuernberg.
**WASTE WATER RECOVERY SYSTEM FOR REDUCTION OF THE DRAINING OF SALT FREIGHT AND FOR BETTER RAT MATERIAL RECOVERY IN THE PRODUCTION OF VANADIUM Final Report, Mar. 1982**
Hans Hess Bonn Bundesministerium fuer Forschung und Technologie Oct. 1982 29 p In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-82-179; ISSN-0340-7608) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 6

The possibility to convert existing technology and develop a demineralizing process was demonstrated. The following results to environmental problems were obtained: (1) relief of the drainage from neutral salts as sodium sulfate and ammonium sulfate; (2) relief of the dumps through minimizing of special waste material dumping; (3) relief of the drinking water supply; (4) better utilization of industrial chemicals by recycling; (5) recovery of a chromium rat material and processing of chromium waste liquors ex other productions. The new process should economically prove that this enormous relief of the environment could be performed by covering its costs. A 1 year pilot scale operation of the plant showed the following: relief of the drainage, relief of the dumps for special waste material, relief of the drinking water supply, and the recycling of industrial chemicals were feasible. E.A.K.

**N83-18097#** Bayer A.G., Leverkusen (West Germany).
**CHEMICAL OXIDATION PURIFICATION OF INDUSTRIAL WASTE WATERS Final Report, Dec. 1980**
Klaus Holze, Axel Vogel, Rainer Loeser, Rudolf Braden, Volker Golzke, Axel Schulz-Walz, Otto Horak, Helmut Waldmann, Klaus-Guenther Wilms, and Gerd Siekmann Bonn Bundesministerium fuer Forschung und Technologie Oct. 1982 106 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-82-187; ISSN-0340-7608) Avail: NTIS HC A06/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 22

The purification of waste water from large scale chemical production which are difficult to degrade by biological means was investigated. The chemical oxidation of waste water constituants using three modifications of wet oxidation as well as the direct oxidation with hydrogen peroxide is discussed. Regardless of chemical composition the direct oxidation with hydrogen peroxide may achieve COD reductions up to 85%, using ambient temperatures, atmospheric pressure and iron catalysts. An inherent feature of this process is found in a partial oxidation using lower than stoichiometric H2O2 amounts to prepare hard to degrade waste water for a final biological purification. E.A.K.

**N83-18098#** Oesterreichisches Bundesinst. fuer Gesundheitswesen, Vienna (Austria).
**MONITORING OF THERMAL DISCHARGES IN RUNNING STREAMS WATER [UEBERWACHUNG THERMISCHER ABWAESSER IN FLIESSGEWAESSERN]**
K. Zirm, F. Fibich, E. Fotter, W. Pillmann, and E. Tuerscherl Sep. 1982 111 p refs In GERMAN; ENGLISH summary Original contains color illustrations
(Contracts BMfBuT-GZ.46222/222; BMfBuT-GZ.46222/101)
Avail: NTIS HC A06/MF A01

Advanced remote sensing methods which use an airborne electronic scanner for measuring the temperature of water surfaces were studied. The thermal structure of the river Danube was investigated on 2 ways of characteristic river flow using data gathered during flights. The image processing system UMIDAS was used. Thermal discharges of river cooled power stations were analyzed. Results of a commonly accepted mathematical model are compared and contrasted with remotely sensed thermal data. Main results: remote sensing appears to be an appropriate means for monitoring the thermal situation of a river. The greatest thermal load of the river Danube was found in the vicinity of Vienna. E.A.K.

**N83-18099#** Sigma Research, Inc., Richland, Wash.
**ENVIRONMENTAL RISK ASSESSMENT: HOW NEW REGULATIONS WILL AFFECT THE UTILITY INDUSTRY**
R. J. Hoch Oct. 1981 244 p Proceedings of a Conf. on Environ. Risk Assessment, New Orleans, 10-11 Dec. 1980 Sponsored by Electric Power Research Inst.
(EPRI Proj. 1316-6)
(DE82-900869; EPRI-EA-2064; CONF-801274) Avail: NTIS HC A11/MF A01

Risk assessment for electric utilities, an increasingly important part of regulatory processes that are designed to be preventive rather than corrective is discussed. Today, emphasis is placed on avoiding environmental pollution and human exposure to toxic or carcinogenic substances rather than remedying situations. Presentations defined risk assessment in terms of its applications in the decision making process, risk benefit analyses, and judicial decisions. DOE

**N83-18100#** Los Alamos Scientific Lab., N. Mex.
**PROCEEDINGS OF THE WORKSHOP ON RADIOACTIVITY ASSOCIATED WITH COAL GAS**
Paul Wagner and N. Roy Greiner Dec. 1981 70 p refs Workshop held in Santa Fe, N. Mex., 15-17 Sep. 1981
(Contract W-7405-eng-36)
(DE82-007880; LA-9106-C; CONF-8109115-Summ) Avail: NTIS HC A04/MF A01

Research issues associated with radioactivity resulting from the use of coal for electric power generation are discussed. The concensus was that a moderate to strong need exists for research in solubility of fly ash in different fluids and for determination of radioactivity in construction materials. Several additional research issues were identified but were given a lower priority. Some effects of coal combustion on the radiation environment; radionuclides in western coal at Mound; low level radiation in coals utilized and ashes produced at New York State electric utilities chemistry of radionuclides in coal preparation; uranium daughters in natural atmospheric aerosols and coal fired power plant emission; possible contributions of coal extraction and utilization to radioactivity contributions in drinking water; and impact on water quality from radionuclides in coal are among the topics discussed. DOE

**N83-18101#** New Jersey Inst. of Tech., Newark.
**LEACHATE-TREATMENT TECHNIQUE UTILIZING FLY ASH AS LOW-COST SORBENT Quarterly Progress Report**
John W. Liskowitz, James Grow, Mung Sheih, Richard Trattner, John Kohut (Public Service Electric and Gas Co.), and Melvin Zwillenberg (Public Service Electric and Gas Co.) 1982 46 p
(Contract DE-FG22-80PC-30231)
(DE82-010501; DOE/PC-30231/3) Avail: NTIS HC A03/MF A01

Twelve different coals were burned in three different types of boilers to determine the influence of coal composition, ash fusion temperatures, boiler additives, combustion conditions and co-firing of natural gas or oil with the coal, on the composition of the fly ash and bottom ash as well as the leaching and sorbate characteristics of the fly ash produced. The trace element analysis in the twelve coals and their respective fly and bottom ashes as well as

surface analysis of a selected number of fly ashes using ESCA is reported. The leaching characteristics of the fly ashes with respect to pH were defined for several trace elements. Leaching of Cd, B, Sn, Ni, Pb, Mo, Cu, Cr, Zn, Mu and Fe was found to be directly proportional to (1) the amount of these trace elements present; (2) decreases in pH; (3) decreases in boiler temperatures; and (4) increases in ash fusion temperatures. Fly ash particles which leached the least amount of the above elements exhibited the best sorbate characteristics. DOE

**N83-18102#** Dames and Moore, Washington, D. C.
**ENVIRONMENTAL IMPACTS OF UNDERGROUNDING HIGH-VOLTAGE TRANSMISSION: HEALTH AND SAFETY**
M. David Maloney 1981 12 p refs Presented at the 3rd Symp. on Environ. Concerns in Rights-of-Way Management, San Diego, Calif., 15 Feb. 1982
(Contract DE-AC01-78ET-29163)
(DE82-010108; DOE/ET-29163/1; CONF-820215-2) Avail: NTIS HC A02/MF A01

Electric and electromagnetic effects of transmission cables are described quantitatively, together with an indication of the potential impacts to the public health and safety. The three major types of cable systems commercially available, as well as advanced system designs for future applications, are considered at voltage levels from 345 kV to 1100 kV. Both ac and dc cable systems can be designed for minimal impact wherever strict engineering or environmental constraints are appropriate. DOE

**N83-18103#** SRI International Corp., Menlo Park, Calif.
**THREE-DIMENSIONAL POOL-SWELL MODELING OF A MARK 1 SUPPRESSION SYSTEM Final Report**
R. L. Kiang and B. J. Grossi Oct. 1981 335 p refs Sponsored by EPRI
(EPRI Proj. 693-1)
(DE82-900972; EPRI-NP-2061) Avail: NTIS HC A15/MF A01

The dynamic response of a Mark 1 pressure suppression system during the early air discharging phase of a postulated loss coolant accident was studied via scale model experiments. Tests using a 11.7 scale model yielded quantitative information on the vent clearing process, the pool swell, the loads on the torus and the ring header, and many other dynamic responses. Corresponding information for the reference plant from which the model is scaled are obtained from the tests results and the scaling laws. DOE

**N83-18104#** Oak Ridge National Lab., Tenn. Environmental Sciences Div.
**STATISTICAL DATABASE MANAGEMENT FOR ECOSYSTEM-EFFECTS ANALYSIS**
Jonathan C. Goyert and Karen L. Daniels 1981 12 p Presented at the Workshop on Statist. Data Base Management, Menlo Park, Calif., 2 Dec. 1981
(Contract W-7405-eng-26)
(DE82-005199; CONF-811208-4) Avail: NTIS HC A02/MF A01

A team of scientists in the Environmental Sciences Division (ESD) at Oak Ridge National Laboratory has developed a multi-year study to estimate the environmental effects of a synthetic oil spill into lentic freshwater ecosystems. The toxicity of synthetic fuels was evaluated at three levels of increasing complexity; single species bioassays, laboratory microcosms, and outdoor pond ecosystems. A statistical database management system had to be developed that would organize, document, retrieve, and analyze the large amounts of data that were generated during the study. The potential problems anticipated in developing the database included: (1) developing a logical file organization and documentation system; (2) designing consistent and unambiguous code sheets while satisfying the needs of different scientific investigators; and (3) creating and updating data files during the period of study. These problems were resolved. DOE

**N83-18105#** Electric Power Research Inst., Palo Alto, Calif.
**PROCEEDINGS OF THE US-JAPAN SEMINAR: MEASUREMENT AND CONTROL OF PARTICULATES GENERATED FROM HUMAN ACTIVITIES**
M. K. First, ed. and S. Masuda, ed. Dec. 1981 385 p refs Seminar held in Kyoto, 11-13 Nov. 1980
(DE82-902224; EPRI-CS-2145-SR; CONF-8011133) Avail: NTIS HC A17/MF A01

Detailed research into particle measurements, electrostatic precipitation of particles, fabric filtration for high efficiency collection, granular bed filters, wet collectors, gas cleaning at high temperature and pressure, and related health effects was discussed. DOE

**N83-18106#** Pacific Northwest Lab., Richland, Wash.
**COMPOSITE DESIGN OF AN ADVANCED AIRBORNE MONITORING SYSTEM**
Kenneth M. Busness, Abdul J. Alkezweeny, Richard C. Easter, Jeremy M. Hales, and Richard N. Lee Dec. 1981 16 p refs Presented at the Spec. Conf. on In-Situ Air Quality Monitoring from Moving Platforms, San Diego, Calif., 18 Jan. 1982
(Contract DE-AC06-76RL-01830)
(DE82-006980; PNL-SA-10089; CONF-820117-1) Avail: NTIS HC A02/MF A01

Atmospheric chemistry investigations often require a multitude of measurements which can be obtained only through the utilization of airborne sampling platforms. Instrument limitations and the aircraft environment present several considerations for sampling-system design, including such factors as instrument sensitivities and response times, altitude effects, sampling intervals for acquiring samples, and physical compatibility with the aircraft. An aircraft system with an extensive evolutionary instrument array has been in development at PNL for several years during which several special systems have been developed to improve aircraft measurement capabilities. A high-volume air sampling system providing flows of up to 4 cu m/min and simultaneous collection of three filters in parallel has been constructed to reduce filter collection times. A constant pressure inlet system was developed to overcome adverse effects in instrument response resulting from altitude changes. DOE

**N83-18107#** Oak Ridge National Lab., Tenn.
**MICROPOLLUTANTS PRODUCED BY DISINFECTION OF WASTEWATER EFFLUENTS**
R. L. Jolley, R. B. Cumming, N. E. Lee, J. E. Thompson, and L. R. Lewis 1981 25 p refs Presented at the Spec. Conf. on Micropollutants in the Environ., Brussels, 22-25 Nov. 1981
(Contract W-7405-eng-26)
(DE82-004064; CONF-811170-1) Avail: NTIS HC A02/MF A01

Recent research conducted with the objective of determining some of the chemical mutagenic characteristics of nonvolatile micropollutants in treated wastewater effluents is summarized. The effluents from nine wastewater plants were examined relative to the chemical effects of the disinfectants chlorine, ozone, and UV light on nonvolatile organic constituents and the formation of mutagenic constituents during disinfection. Results indicate that disinfection by chlorine or ozone can lead to an increase in the number of mutagenic materials in the effluents. DOE

**N83-18108#** Radian Corp., Sacramento, Calif.
**IMPACT OF AIR POLLUTION CONTROL REGULATIONS ON THERMAL ENHANCED OIL RECOVERY PRODUCTION IN THE UNITED STATES Final Report**
James F. Norton, James D. Rouge, Pamela K. Beekley, Stuart N. Husband, C. W. Arnold, William R. Menzie, and Howard W. Balentine Mar. 1982 293 p refs
(Contract DE-AC03-78SF-01863)
(DE82-011237; DOE/SF-01863/1) Avail: NTIS HC A13/MF A01

The impact of air pollution control regulations on the costs of present and future thermal enhanced oil recovery (TEOR) production was assessed. It is indicated that lengthy permitting processes, limited control system availability, and costly control system requirements complicate regulatory compliance and constrain TEOR production expansion. Air pollution control rule and regulation requirements were determined for each production area. State-of-the-art air pollution control technology was assessed and costs were estimated for the control systems needed to comply

with previous new source review (NSR) and retrofit rules in each area. Costs were calculated for the control systems required to allow the maximum increase in TEOR production. An air quality impact analysis was performed for the four largest production areas. The air quality changes associated with the maximum TEOR production increase and compliance with retrofit and NSR rules are estimated. DOE

**N83-18109#** Massachusetts Inst. of Tech., Cambridge. Energy Lab.
**ESTIMATING POLLUTANT EXPOSURES FROM COAL FIRED POWER PLANTS IN A RURAL REGION**
Stuart Batterman, Marc Schenker, Frank Speizer, and James Gruhl Dec. 1981 37 p refs Prepared in cooperation with Harvard Medical School
(Contract DE-AM01-76EI-02295)
(DE82-008136; MIT-EL-81-047) Avail: NTIS HC A03/MF A01

Aspects of air pollution exposure estimates which are relevant to epidemiologic studies are discussed. It is demonstrated that measures of air pollution exposures, once taken as a routine and trivial matter, are in fact as complex and important as other considerations in the epidemiological investigation. Biased or erroneous air pollution measures produce invalid exposure estimates as would any other incorrectly measured risk factor. The selection of the best pollution measure for an era is influenced by regional characteristics, such as terrain, meteorology, pollutant sources and monitor location. Lacking a standardized procedure, good judgement is essential in selecting pollutant measure for a particular study. Appropriate criteria for selecting a pollution measure are appropriateness and stability. Data from the monitoring of sulfur dioxide and total suspended particulate over a 5 year period are included. DOE

**N83-18110#** Department of Energy, New York. Environmental Studies Div.
**ENVIRONMENTAL MEASUREMENTS LABORATORY ENVIRONMENTAL REPORT Progress Report, 1 Mar. - 1 Sep. 1981**
Edward P. Hardy, Jr. 1 Nov. 1981 234 p refs
(DE82-010090; EML-395) Avail: NTIS HC A11/MF A01

Interpretive reports and notes dealing with cesium-137 concentrations in food in India, fission product radionuclides in surface air in India, strontium-90 concentrations in New York and San Francisco, human bone and diet through 1980, and global fallout inventories of strontium-90 through 1980 are given. Tabulations of strontium-90 fallout, chemical constituents of wet and dry deposition, radionuclides and trace metals in surface air, radioactivity and trace gases sampled in the stratosphere by aircraft, strontium-90 in San Francisco and New York diet, milk, tap water and human bone, and cesium-137 in Chicago foods are given. A bibliography of recent publications related to environmental studies is also presented. DOE

**N83-18111#** Pacific Northwest Lab., Richland, Wash.
**ATMOSPHERIC TRANSPORT MODELING**
J. V. Ramsdell Nov. 1981 7 p refs Presented at the NRC Workshop on Meteorol. Aspects of Emergency Response Plans for Nucl. Power Plants, Menlo Park, Calif., 103 Dec. 1981
(Contract DE-AC06-76RL-01830)
(DE82-005880; PNL-SA-10050; CONF-811223-2) Avail: NTIS HC A02/MF A01

Predictions or estimates of the transport of materials in the atmosphere following an accident depend upon knowledge of the wind field in the vicinity of the accident site. Wind field models range in sophistication from simple straightline transport models to approximate solutions of the full set of Navier-Stokes equations in three dimensions. The basic types of models in order of increasing sophistication include: uniform wind field; area of influence; empirical interpolation; objective analysis; simplified physics; and full physics (primative equation). With increased sophistication comes also increased memory, computational time, and data input requirements. Each of the six types of models are discussed. DOE

**N83-18112#** Oak Ridge Gaseous Diffusion Plant, Tenn. Technical Services Div.
**ORGANIC PRIORITY POLLUTANTS IN WASTEWATER**
L. W. McMahon Mar. 1982 31 p refs Presented at the UCC-ND and GAT Environ. Protection Seminar, Gatlinburg, Tenn., 5 Apr. 1982
(Contract W-7405-eng-26)
(DE82-008326; K/TL/AT-98; CONF-820418-8) Avail: NTIS HC A03/MF A01

A list of toxic pollutants to be controlled, discharge limitations for those compounds in water effluents, and methods for quantitating those compounds was published. Of the 129 compounds designated as priority pollutants 114 are organic compounds. The gas chromatography/mass spectrometry methods of analysis were applied to waste water from a gaseous diffusion plant. All toxic pollutants identified in the waste water are from the volatile fraction. The concentrations of these organic pollutants range from < 10 ppB to approximately 2 ppM. DOE

**N83-18113#** Princeton Univ., N. J.
**MIGRATION OF PETROLEUM PRODUCTS ACCIDENTALLY INTRODUCED INTO THE SUBSURFACE THROUGH SPILLS**
Linda M. Abriola and George F. Pinder 1982 54 p refs
(Contract DE-AC02-79EV-10257)
(DE82-008877; DOE/EV-10257/1; Rept-81-WR-9) Avail: NTIS HC A04/MF A01

A discussion and assessment are presented of the important phenomena governing the infiltration and migration of petroleum products in the subsurface as gleaned from laboratory and field studies. The information is analyzed with a view towards incorporating these phenomena into a mathematical model. Such a model would serve as a valuable planning and predictive tool by tracing future oil migration and simulating the effects of various remedial schemes. Discussed are the influences of gravity, capillary forces, solubility, and evaporation. Natural influences serving to retard the migration such as adsorption onto soil particles and biodegradation by soil microorganisms are also covered. DOE

**N83-18114#** Institute of Ecology, Indianapolis, Ind.
**POTENTIAL SIGNIFICANCE OF TROPICAL ORGANIC SOILS FOR THE CARBON BALANCE OF THE TERRESTRIAL BIOSPHERE**
Thomas V. Armentano 1981 22 p refs Presented at the Intern. Soc. for Trop. Ecol. Jubilee Symp., Bhopal, India, Oct. 1981 Submitted for publication
(Contract DE-AC02-81EV-10725)
(DE82-011827; DOE/EV-10725/2; CONF-8110167-1) Avail: NTIS HC A02/MF A01

Available data on tropical wetlands in relation to the carbon cycle is reviewed and organic soil deposits for which additional data are needed for a complete analysis of the present and future carbon balance are identified. Emphasis is placed on tropical and temperate forests which contain over 75% of the carbon stored in the terrestrial biosphere. Although there is considerable uncertainty about rates, increased clearing of tropical forests is probably reducing the total quantity of stored carbon, creating a net carbon source. Other ecosystems such as grasslands, savannahs and wetlands also are contributing to biospheric carbon exchange. Pressures for development of tropical wetlands are mounting as food requirements rise. In some areas, particularly in Africa and southeast Asia, nearly all well drained, arable lands are already fully utilized. Thus, whether tropical wetlands are operating as net carbon sinks or net carbon sources depends on the extent to which they are being altered. DOE

**N83-18115#** Du Pont de Nemours (E. I.) and Co., Aiken, S.C. Environmental Sciences Div.
**ANALYSIS PROCEDURE FOR AMERICIUM IN ENVIRONMENTAL SAMPLES**
Robert W. Holloway and David W. Hayes Jan. 1982 14 p refs
(Contract DE-AC09-76SR-00001)
(DE82-009270; DP-1608) Avail: NTIS HC A02/MF A01

Several methods for the analysis of Am 241 in environmental

samples were evaluated and a preferred method was selected. This method was modified and used to determine the Am 241 content in sediments, biota, and water. The advantages and limitations of the method are discussed. The method is also suitable for Cm 244 analysis. DOE

**N83-18116#** Colorado State Univ., Fort Collins.
**ENVIRONMENTAL RADIATION SURVEILLANCE PROGRAM Summary Report, Jul. - Dec. 1981**
1981 146 p
(DE82-902009; NP-2902009) Avail: NTIS HC A07/MF A01

The power generating record for the Fort St. Vrain Nuclear Generating Station during the last half of 1981 is presented. The energy generation was slightly greater than during the first half of 1981 and the highest for any previous 6 month reporting period. Any correlation of radioactivity in environmental samples with the effluent release data is discussed. DOE

**N83-18117#** Sandia Labs., Albuquerque, N. Mex.
**SITE SELECTION AND CHARACTERIZATION FOR AN UNDERGROUND COAL GASIFICATION TEST IN WASHINGTON STATE. VOLUME 2: PROJECT DETAILS Final Report**
Lewis C. Bartel, comp. and Stanley L. Love, comp. Dec. 1981 299 p refs 2 Vol.
(Contract DE-AC04-76DP-00789)
(DE82-010948; SAND-81-2051/2) Avail: NTIS HC A13/MF A01

Selection and characterization of a site suitable for an underground coal gasification (UCG) experiment was undertaken. A set of general criteria, based on previous UCG experience was used to screen potential sites. The Tono Basin in the Centralia Chehalis coal district, was selected for detailed characterization. The basin near the Centralia Steam Electric Generating Plant, and it contains a 47 foot thick seam of subbituminous coal at a depth of about 600 feet. Geothermal characterization of Tono was accomplished by using a combination of surface seismic surveys, surface electromagnetic surveys, borehole logging, coring, and hydrological testing. An environmental survey of the Tono Basin was also conducted. The results of the project have not disclosed any characteristics which would preclude conducting a gasification experiment in the Tono Basin. DOE

**N83-18118#** California Univ., Livermore. Lawrence Livermore Lab.
**CLEANUP OF GROUNDWATER CONTAMINATED BY UNDERGROUND COAL GASIFICATION**
Ellen Raber, Robert E. Thompson (M. O. Schultz and Co.), Floyd H. Smith (National Technical Service, Inc.), and Virgil L. Duval 1981 22 p refs Presented at the SPE Ann. Tech. Conf. and Exhibition, San Antonio, 4-7 Oct. 1981
(Contract W-7405-eng-48)
(DE82-005824; UCRL-86502; CONF-811023-7) Avail: NTIS HC A02/MF A01

Bench scale laboratory experiments confirmed the high adsorption capacity of bituminous activated carbon for the removal (> 99.9%) of organic contaminants found in groundwaters associated with underground coal gasification (UCG) sites. Based upon recent laboratory and field interpretations, engineering designs are presented for the surface treatment of groundwater contaminated by UCG operations. A methodology is suggested for consideration of other unconventional in situ treatments. DOE

**N83-18145#** California Inst. of Tech., Pasadena.
**BIOMINERALS, TRACERS OF EVOLUTION, PALEOECOLOGY AND IMPACT OF LIFE ON THE BIOSPHERE**
Heinz A. Lowenstam *In* Illinois State Geological Survey Perspectives in Geol. 1982 p 41-42 ref (For primary document see N83-18138 08-46)
Avail: NTIS HC A04/MF A01 CSCL 08G

# 46 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.

For space radiation see *93 Space Radiation.*

**N83-18119** Institut d'Aeronomie Spatiale de Belgique, Brussels.
**STRATOSPHERIC NEGATIVE ION COMPOSITION MEASUREMENTS, ION ABUNDANCES AND RELATED TRACE GAS DETECTION**
E. Arijs, D. Nevejans, P. Frederick, and J. Ingels 1982 43 p refs In ENGLISH; FRENCH, GERMAN and DUTCH summaries Previously announced as A82-43530 Submitted for publication
(Contract NFWO-2.0009.79)
(Aeronomica-Acta-A-245-1982) Avail: Issuing Activity

For abstract see A82-43530.

**N83-18120** Institut d'Aeronomie Spatiale de Belgique, Brussels.
**THE NATURAL AND PERTURBED OZONOSPHERE**
G. Brasseur, A. deRudder, and A. Roucour 1982 79 p refs In ENGLISH; FRENCH, GERMAN and DUTCH summaries Presented at Intern. Conf. on Environ. Pollution, Thessaloniki, Greece, 21-24 Sep. 1981
(Aeronomica-Acta-A-250-1982) Avail: Issuing Activity

The purpose of the present study is to describe the behavior of the most important stratospheric minor constituents. A synthetic review of the principal chemical and photochemical processes is given. One dimensional models are quite adequate to test the chemical and photochemical scheme which is provided by the laboratory work. Even if the knowledge of the quantitative values of the rate constants has been greatly improved in the recent past, many unsolved problems remain. In particular, the odd hydrogen distribution which is a central question in the stratosphere as well as the water vapor budget need further consideration. The calculated amount of most long-lived species produced at ground level and transported into the stratosphere is generally overestimated. There are some difficulties in reproducing the vertical distribution of these gases with a unique eddy diffusion profile. The budget of odd chlorine and odd nitrogen in the upper stratosphere is not completely understood. Perturbation of the ozonosphere due to anthropogenic emissions of chlorofluorocarbons and of nitrogen oxide is considered. Author

**N83-18121*#** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
**ON THE DESIGN OF AN INTERACTIVE BIOSPHERE FOR THE GLAS GENERAL CIRCULATION MODEL**
Yale Mintz, Piers J. Sellers, and Cort J. Willmott Jan. 1983 62 p refs
(NASA-TM-84973; Rept-911; NAS 1.15:84973) Avail: NTIS HC A04/MF A01 CSCL 04A

Improving the realism and accuracy of the GLAS general circulation model (by adding an interactive biosphere that will simulate the transfers of latent and sensible heat from land surface to atmosphere as functions of the atmospheric conditions and the morphology and physiology of the vegetation) is proposed. Author

**N83-18122#** Finnish Meteorological Inst., Helsinki.
**METEOROLOGICAL YEARBOOK OF FINLAND, VOLUME 71-80, PART 4.1: MEASUREMENTS OF SOLAR RADIATION, 1971 - 1980**
Eija Lumme 1982 225 p In FINNISH and ENGLISH
(ISBN-951-697-185-7; ISSN-0076-6763) Avail: NTIS HC A10/MF A01

Solar radiation measurements during the years 1971 to 1980 are provided. Author

**N83-18123#** Technische Hochschule, Karlsruhe (West Germany). Inst. fuer Petrographie und Geochemie.
**APPLICATION OF ENERGY DISPERSIVE X-RAY FLUORESCENCE, ION SENSITIVE ELECTRODES AND INSTRUMENTAL NEUTRON ACTIVATION IN GEOCHEMICAL PROSPECTING**

**Final Report, Sep. 1981**
Utz Kramar, John Norbert, and Harald Puchelt Bonn Bundesministerium fuer Forschung und Technologie Sep. 1982 76 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-82-152; ISSN-0340-7608) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 16

Extraction methods were tested for their suitability in geochemical prospecting for fluorite in stream sediments. The most common fluorine bearing minerals were treated with different extractants and the most favorable conditions for the determination of fluorine by ionsensitive electrodes were determined. Radionuclide fluorescence analysis with semiconductor detector and online data handling is a method for simultaneous multielement determinations applicable for different kinds of samples as soils, stream sediment and rocks. Measuring parameters, like sample geometry, conditions for the excitation of the characteristic X-rays, measuring time and grain size were optimized for a high output and simplest sample pretreatment. Both methods, F-analysis by ionsensitive electrodes and radionuclide X-ray fluorescence analysis were used for a reconnaissance stream sediment survey. E.A.K.

**N83-18124#** European Space Agency, Paris (France).
**COMPUTATION OF THE EARTH'S RADIATION BUDGET FROM SPECTRAL RADIANCE MEASUREMENTS OF THE SATELLITE METEOSAT**
M. Gube (ESOC, Darmstadt, West Germany) Nov. 1982 73 p refs
(ESA-STR-210; ISSN-0379-4067) Avail: NTIS HC A04/MF A01

A method to determine radiation budget components, planetary albedo and emitted longwave radiation flux density at the top of the atmosphere from satellite measurements of filtered radiances is presented. The transformation of radiance to flux density and the spectral integration of the measured values is based on radiative transfer models for the solar and terrestrial spectral range. These model calculations are made for a wide variety of atmospheric profiles. The method is applied to data of the geostationary satellite 'Meteosat'. Geostationary satellite data can furthermore monitor diurnal changes of the radiation budget components over several geographical locations. E.A.K.

**N83-18125#** Oesterreichische Akademie der Wissenschaften, Vienna. Inst. fuer Weltraumforschung.
**RESULTS OF THE ELECTRON SPECTROMETER AND THE WAVE PARTICLE INTERACTION EXPERIMENT ON THE PAYLOAD E2-B**
A. Urban, M. P. Gough (Sussex Univ., England), and K. M. Torkar Sep. 1982 36 p refs Prepared in cooperation with Technical Univ., Graz
(IWF-8210) Avail: NTIS HC A03/MF A01

The E-field, the emissions of infrared, visible and ultraviolet light, the particle streams and plasma waves associated with an auroral arc were studied. Results are reported for the energetic electron spectrometer to detect electrons in the energy range 0.3 - 25 keV. An associated microprocessor accurately timed the electron detection pulses and calculated autocorrelation functions for each of 16 energy levels. The shape of the energy spectrum indicates wave particle interactions. Autocorrelation functions corresponding to energy levels close to the beam energy show that over 30% of the electrons were modulated at 2.8 MHz and simultaneously at 250 kHz. The frequencies correspond to electrostatic and electromagnetic waves, respectively and it is indicated that the auroral primary beam is undergoing a beam plasma interaction. E.A.K.

**N83-18126#** Karlsruhe Univ. (West Germany). Ausbreitungs- und Transportvorgaenge in Stroemungen.
**NUMERIC SIMULATION OF ATMOSPHERIC FLOWS IN BOUNDARY LAYERS ABOVE LONG-DISTANCE MESOSCALE CHAIN OF HILLS NEAR THE NEUTRAL THERMAL LAYER [NUMERISCHE SIMULATIONEN ATMOSPHAERISCHER GRENZSCHICHTSTOREMUNGEN UEBER LANGGESTRECKTEN MESOSKALIGEN HUEGELKETTEN BEI NEUTRALER THERMISCHER SCHICHTUNG]**
Gisela Tangermann-Dlugi Aug. 1982 178 p refs In GERMAN Sponsored by Deutsche Forschungsgemeinschaft
(SFB--80/T/215) Avail: NTIS HC A09/MF A01

A two dimensional flow model which gives numerical simulation of atmospheric boundary layers of mesoscales along the infinitely expanded horizontal gamma direction and which allows mesoscale obstacles at neutral thermal stratification was developed. The model is based on the unfiltered Navier-Stokes equations of hydro-thermodynamics. Orographic effects of external, impressed forces, structures of obstacles, and the dependence of the integration geometry and its position as related to the geostrophic wind are investigated. The effects are dependent on the rate of inertia and the increase of obstacles. It is shown that the turbulent friction and the coriolis force, the flow direction and the integration geometry are important in the numerical measurements. Transl. by E.A.K.

**N83-18127*#** Iowa Univ., Iowa City. Dept. of Physics and Astronomy.
**ELECTROSTATIC BURSTS GENERATED BY ELECTRONS IN LANDAU RESONANCE WITH WHISTLER MODE CHORUS Progress Report**
Lee A. Reinleitner, Donald A. Gurnett, and Timothy E. Eastman Jul. 1982 69 p refs Submitted for publication
(Contracts NAS5-20093; NAS5-26819; NAS5-11074; NAS5-26257; Grants NGL-16-001-002; NGL-16-001-043; Contract N00014-76-C-0016)
(NASA-CR-169852; NAS 1.26:169852; AD-A121615; U-OF-IOWA-82-24) Avail: NTIS HC A04/MF A01 CSCL 04A

The electrostatic bursts analyzed in this paper have a frequency much greater than that of the chorus. The frequency is usually somewhat lower than the electron plasma frequency and is normally in the range from about 3 kHz up to kHz. As will be shown, the electrostatic bursts are longitudinal electrostatic waves with wave vectors aligned almost exactly along the ambient magnetic field. In some cases, the amplitude of the electrostatic bursts is shown to have a modulation at the chorus frequency. This modulation is indicative of a strong physical interaction between these two wave modes. This paper details the investigation of this interaction and provides strong evidence that the electrons responsible for the electrostatic bursts are trapped and accelerated by a Landau resonance interaction with the chorus wave. The primary data used in this work was obtained from the ISEE 1 and ISEE 2 (International Sun-Earth Explorer) spacecraft, which were launched into Earth orbit simultaneously on October 22, 1977. A description of the spacecraft orbital parameters is contained in Anderson et al. (1981). The plasma wave data used was obtained from the University of Iowa Plasma Wave Experiment, and the instrumentation is described in detail by Gurnett et al. (1978). GRA

**N83-18128#** Brookhaven National Lab., Upton, N. Y. Atmospheric Sciences Div.
**INTERACTION OF THE ATMOSPHERIC BOUNDARY LAYER WITH LARGE-SCALE PROCESSES OVER THE BAY OF BENGAL DURING MONEX79**
S. SethuRaman 1981 7 p refs Intern. Conf. on Sci. Results of the Monsoon Expt., Denpasar, Bali, 26-30 Oct. 1981
(Contract DE-AC02-76CH-00016)
(DE82-005503; BNL-30322; CONF-8110143-1) Avail: NTIS HC A02/MF A01

The role of the atmospheric boundary layer in the Bay of Bengal cyclogenesis processes is discussed. The boundary layer experiment at Digha consisted of three main components: a 10 m micrometeorological tower at the beach with instruments to observe turbulent fluxes of heat and momentum over the ocean; a weather station that continuously recorded mean parameters; and pilot balloon observations to a height of about 1000 m. DOE

**N83-18129#** Sandia Labs., Albuquerque, N. Mex.
**INTERFACE TEST SERIES: AN IN SITU STUDY OF FACTORS AFFECTING THE CONTAINMENT OF HYDRAULIC FRACTURES**

N. R. Warpinski, S. J. Finley, W. C. Vollendorf, M. OBrien, and E. Eshom Feb. 1982 88 p refs
(Contract DE-AC04-76DP-00789)
(DE82-009354; SAND-81-2408) Avail: NTIS HC A05/MF A01

In situ experiments, which are accessible for direct observation by mineback, were conducted to determine the effect that material-property interfaces and in situ stress differences have on hydraulic fracture propagation and the resultant overall geometry. These experiments show conclusively that a difference in elastic modulus at a geologic interface has little or no effect on crack growth and, therefore, is not a feature which would promote containment of fractures within a specified reservoir zone. However, differences in the in situ stress between adjacent layers is shown to have a considerable influence on fracture propagation. Experiments were conducted in a low modulus ash-fall tuff which contained two layers of high minimum principal in situ stress and which was overlain by a formation with at least a factor of 5 increase in elastic modulus. Fractures were observed to terminate in regions of high minimum principal in situ stress in nearly every case. DOE

**N83-18130#** Los Alamos Scientific Lab., N. Mex. Earth and Space Science Div.
**PREDICTION OF DELAYED SUBSIDENCE**
Kerry Burns 1981 5 p refs Presented at the Workshop on Surface Subsidence Due to Underground Mining, Morgantown, W. Va., 30 Nov. - 2 Dec. 1981
(Contract W-7405-eng-36)
(DE82-010431; LA-UR-82-286; CONF-811173-3) Avail: NTIS HC A02/MF A01

A predictive model of delayed subsidence is discussed. A numerical implementation is tested on one of the best-described study areas, Allegheny County in Pennsylvania. In planning insurance of restitution measures, a predictive model is of value in estimating the magnitude of the problem and the size of long-term budgetary commitments. Contrary to active subsidence, which occurs concurrently with mining operations, or is completed within a few days following coal extraction, delayed subsidence may take many years to appear at the surface after coal mines are abandoned. There are two principal morphological types of delayed subsidence: troughs, which are shallow depressions, and sinks, which are steep-sided crown pits. Both types are damaging to surface structures, and a variety of methods were introduced to deal with the problem, ranging from subsidence insurance to site restitution. DOE

**N83-18131#** Sandia Labs., Albuquerque, N. Mex. Computational Physics and Mechanics Div.
**HEATED BLOCK TEST CONCEPTUAL DESIGN CALCULATIONS**
Mark L. Blanford Jan. 1982 31 p refs
(Contract DE-AC04-76DP-00789)
(DE82-010873; SAND-81-1841) Avail: NTIS HC A03/MF A01

Finite element calculations are presented as part of the conceptual design of a heated block test, part of a field test program to measure in situ thermomechanical and hydrologic characteristics of welded tuff at the Nevada Test Site. Thermal and thermomechanical calculations give insight into the optimal placement and power level of heaters, the magnitude of temperature and stress to be expected from the proposed test sequence, and the behavior of a joint field under this stress. DOE

**N83-18132#** Geological Survey, Denver, Colo.
**STRATIGRAPHY AND STRUCTURE OF VOLCANIC ROCKS IN DRILL HOLE USW-G1, YUCCA MOUNTAIN, NYE COUNTY, NEVADA**
Richard W. Spengler, F. M. Byers, Jr., and Jennifer B. Warner (Fenix and Scisson, Inc.) 1981 88 p refs
(Contract DE-AI08-78ET-44802)
(DE82-008517; DOE/ET-44802/T4; USGS-OFR-81-1349) Avail: NTIS HC A05/MF A01

Detailed subsurface studies in connection with the Nevada Nuclear Waste Storage Investigations program are being conducted to investigate the stratigraphic and structural features of volcanic rocks underlying Yucca Mountain, a volcanic highland situated along the western boundary of the Nevada Test Site in southern Nevada. As part of this continuing effort, drill hole USW-G1 was cored from 292 ft to a depth of 6000 ft from March to August 1980. The stratigraphic section is composed of thick sequences of ash-flow tuff and volcanic breccia interbedded with subordinate amounts of fine- to coarse-grained volcaniclastic rocks. All rocks are of Tertiary age and vary in composition from rhyolite to dacite. The 3005-ft level in the drill hole represents a significant demarcation between unaltered and altered volcanic rocks. For the most part, tuff units above 3005 ft appear devitrified and show little secondary alteration except within tuffaceous beds of Calico Hills. DOE

**N83-18133#** California Univ., Livermore. Lawrence Livermore Lab.
**A BRIEF OVERVIEW OF GEOPHYSICAL PROBING TECHNOLOGY**
A. L. Ramirez and R. J. Lytle 1 Feb. 1982 20 p refs
(Contract W-7405-eng-48)
(DE82-011217; UCID-19308) Avail: NTIS HC A02/MF A01

High-resolution geophysical techniques which can be used to characterize a nuclear waste disposal site were evaluated. The current capabilities and limitations of geophysical methods used for site selection are considered. The capabilities and limitations associated with this technology are reviewed. Both seismic and electromagnetic techniques to obtain high resolution information are examined. The usefulness of geotomography in mapping fracture zones remotely is assessed, core samples are collected to assess the capability of correlating the geophysical data with parameters of interest such as fracture continuity, orientation, and fracture density. DOE

**N83-18134#** Pacific Northwest Lab., Richland, Wash.
**COMPUTER SIMULATION OF GEOLOGIC SYSTEMS**
Michael G. Foley Jan. 1982 9 p Presented at the Waste Management Conf., Tucson, Ariz., 8-11 Mar. 1982
(Contract DE-AC06-76RL-01830)
(DE82-008678; PNL-SA-9889; CONF-820303-21) Avail: NTIS HC A02/MF A01

The Geologic Simulation Model (GSM) is a quasi-deterministic process response model which simulates the development of the geologic and hydrologic systems of a groundwater basin for a million years into the future. Effects of natural processes on the groundwater hydrologic system are modeled principally by rate equations. The combined effects and synergistic interactions of different processes are approximated by linear superposition of their effects during discrete time intervals in a stepwise integration approach. The results of the GSM simulations are not yet defensible. They are promising, and the general behavior of the GSM over the near term (20,000 years) and long term (million years) is plausible. Thus, in terms of a demonstration of the GSM technology alone, the results indicate that the development effort was a success. The usefulness of the GSM results to the demonstration of a coordinated performance analysis technology must be determined by considering the validity of the results and how they may be applied realistically. DOE

**N83-18135#** Yale Univ., New Haven, Conn. Dept. of Geology and Geophysics.
**EXPERIMENTAL STUDY OF OPENING-MODE CRACK GROWTH IN ROCK Progress Report**
Robert B. Gordon Feb. 1982 13 p
(Contract DE-AC02-79ER-10445)
(DE82-008784; DOE/ER-10445/2) Avail: NTIS HC A02/MF A01

The measurement of the fracture energy of rock and the use of the measurements to investigate the relation between fracture toughness and the rock microstructure and mineral content of rock were examined. A series of measurements on different types of rock with a standardized test procedure was used to find differences in fracture energy that are due to the structure and

composition of different types of rock. It is found that the variations in fracture energy between different types of rock are large compared to the errors of measurement and it can be understood in terms of the microstructural processes by which fracture takes place. Additional experiments were done to explore the effects of water on the fracture energy and the effects of texture in the microstructure of the rock. The measurement of the internal friction of the rock while the crack is propagated through the test specimen, is used to help reveal the development of the process zone of microcracks that precedes the development of the open crack during the fracture test. DOE

**N83-18136#** Sandia Labs., Albuquerque, N. Mex. Geotechnology Research Div.
**DESIGN AND MODELING OF SMALL SCALE MULTIPLE FRACTURING EXPERIMENTS**
Jerry F. Cuderman Dec. 1981 32 p refs
(Contract DE-AC04-76DP-00789)
(DE82-010872; SAND-81-1398) Avail: NTIS HC A03/MF A01

In order to design small scale gas fracture experiments, the available data from previous HEGF experiments were carefully reviewed, analytical elastic wave modeling was initiated, and semiempirical modeling was conducted which combined predictions for statically pressurized boreholes with experimental data. The results of these efforts include: (1) the definition of what constitutes small scale experiments for emplacement in a tunnel complex, (2) prediction of average crack radius, in ash fall tuff, as a function of borehole size and energy input per unit length, (3) definition of multiple hydraulic and multiple explosive fracture boundaries as a function of boreholes size and surface wave velocity, (4) semiempirical criteria for estimating stress and acceleration, and (5) a proposal that multiple fracture orientations may be governed by in situ stresses. DOE

**N83-18137#** Department of Energy, Laramie, Wyo. Energy Technology Center.
**HIGH RESOLUTION SEISMIC SURVEY OF THE HANNA, WYOMING UNDERGROUND COAL GASIFICATION AREA**
Alv Dan Youngberg, Ernest Berkman (Emerald Exploration Consultants, Inc.), and Arnold Orange (Emerald Exploration Consultants, Inc.) Jan. 1982 49 p refs
(DE82-006887; DOE/LC-RI-82/1) Avail: NTIS HC A03/MF A01

In November 1980 a high resolution seismic survey was conducted at the underground coal gasification test site near Hanna, Wyoming. The objectives of the survey were to determine the feasibility of utilizing high resolution seismic technology to locate and characterize underground coal burn zones and to identify shallow geologic faults at the test site. Seismic data acquisition and processing parameters were specifically designed to emphasize reflections at the shallow, 61 to 91 meter (200 to 300 foot) depths of interest. An anomaly was clearly discernable resulting from the rubble-collapse void above the burn zone which was studied in detail and compared to synthetic models. It is felt that the seismic method can be used to define similar burns. DOE

**N83-18138#** Illinois State Geological Survey, Champaign. Dept. of Energy and Natural Resources.
**PERSPECTIVES IN GEOLOGY: INVITED PAPERS PRESENTED AT A SYMPOSIUM IN OBSERVANCE OF THE 75TH ANNIVERSARY OF THE ILLINOIS STATE GEOLOGICAL SURVEY**
1982 70 p refs Symp. held in Champaign, Ill., 9-10 Oct. 1980
Prepared for Illinois Inst. of Natural Resources, Springfield
(PB-255589; IL/SGS/Circ-525) Avail: NTIS HC A04/MF A01 CSCL 08G

Perspectives in geology, mineral resources, paleontology, and environmental concerns are presented. Coal geology and petroleum exploration are discussed. Groundwater, nonfuel minerals, and engineering geology are considered. The radioactive waste storage in mined caverns is also discussed. For individual titles, see N83-18139 through N83-18145.

**N83-18139#** Illinois State Geological Survey, Champaign.
**THE ILLINOIS STATE GEOLOGICAL SURVEY. THE NEXT QUARTER CENTURY**
Jack A. Simon *In its* Perspectives in Geol. 1982 p 1-6 (For primary document see N83-18138 08-46)
Avail: NTIS HC A04/MF A01 CSCL 08G

A history of survey programs is presented. Underground storage, toxic waste disposal, land use planning, coal mining, oil and gas exploration, mineral exploration, and geologic hazards are discussed in relation to geologic research. S.L.

**N83-18140#** Exxon Production Research Company, Houston, Tex.
**COAL GEOLOGY. WHO NEEDS IT?**
Harold J. Gluskoter *In* Illinois State Geological Survey Perspectives in Geol. 1982 p 7-11 refs (For primary document see N83-18138 08-46)
Avail: NTIS HC A04/MF A01 CSCL 08G

Geological research is discussed in relation to coal and coal mining. Geophysical and logging techniques used in coal exploration and evaluation are reviewed. S.L.

**N83-18141#** Geological Survey, Washington, D. C.
**US PETROLEUM EXPLORATION. LIKELY TARGETS 1980 - 2000**
Richard F. Mast *In* Illinois State Geological Survey Perspectives in Geol. 1982 p 13-18 refs (For primary document see N83-18138 08-46)
Avail: NTIS HC A04/MF A01 CSCL 08G

Methods of estimating the quantities of undiscovered oil and gas contained in petroleum basins are discussed. Areas of oil and gas exploration are considered. S.L.

**N83-18142#** Geological Survey, Washington, D. C.
**PERSPECTIVES IN GROUNDWATER** c43
George H. Davis *In* Illinois State Geological Survey Perspectives in Geol. 1982 p 19-23 refs (For primary document see N83-18138 08-46)
Avail: NTIS HC A04/MF A01 CSCL 08G

Hydrology as a science is discussed. Modeling of ground water flow is reviewed. Ground water science applications are considered. S.L.

**N83-18143#** Library of Congress, Washington, D. C.
**PERSPECTIVES IN NON-FUEL MINERALS**
Allen F. Agnew *In* Illinois State Geological Survey Perspectives in Geol. 1982 p 25-31 refs (For primary document see N83-18138 08-46)
Avail: NTIS HC A04/MF A01 CSCL 08G

Mineral exploration and utilization are discussed. Problems associated with metallic and nonmetallic minerals, and the significance of these problems are considered. S.L.

**N83-18144#** Harvard Univ., Cambridge, Mass.
**GEOLOGICAL PROBLEMS IN THE GEOCHEMISTRY OF SEDIMENTS**
Raymond Siever *In* Illinois State Geological Survey Perspectives in Geol. 1982 p 33-40 refs (For primary document see N83-18138 08-46)
Avail: NTIS HC A04/MF A01 CSCL 08G

Sedimentary geochemists explain in chemical terms the ways in which the detrital and chemically precipitated components of sediments may form, alter, or disappear in the course of the sedimentary cycle. Those changes may result from subaerial or marine weathering; transport; continental or oceanic deposition in a wide variety of environments; and diagenesis under many different kinds of burial regimes. Modern and ancient processes including those that occurred early in the history of Earth before any preserved record of sedimentary rock deposition are studied. Geochemical reactions have an immense range of speeds. Among the fastest are biochemical pathways, mediated by enzymes, by which minerals such as carbonates, phosphates, iron oxides, and fluorite are precipitated. Some are of moderate speed, such as the ion-exchange of clay minerals when river water meets sea water. S.L.

N83-18145# California Inst. of Tech., Pasadena.
**BIOMINERALS, TRACERS OF EVOLUTION, PALEOECOLOGY AND IMPACT OF LIFE ON THE BIOSPHERE** c45
Heinz A. Lowenstam *In* Illinois State Geological Survey Perspectives in Geol. 1982 p 41-42 ref (For primary document see N83-18138 08-46)
Avail: NTIS HC A04/MF A01 CSCL 08G

A vast array of recent organisms are known to pecipitate minerals. The elucidation of the Phanerozoic history of numerous protists and many animal groups owes its documentation to phosphate, carbonate, and silica mineral-bearing skeletal remains. The existence of sulfate reducing bacteria as old as 2 eons and possibly 3.2 eons B.P. was established by means of S-34/S-32 ratios from sulfide minerals found in sedimentary Precambrian rocks. Studies of crystal habits, trace element constituents, and stable isotopes in skeletal carbonate minerals, phosphates, and silica show that they embody genetic and environmental information. Biologic mass fixation of silica in the sea has resulted in undersaturation of ocean water and suppression of opal precipitation by inorganic processes. S.L.

# 47 METEOROLOGY AND CLIMATOLOGY

Includes weather forecasting and modification.

N83-18146 Freie Univ., Berlin (West Germany). Dept. of Meteorologie.
**METEOROLOGICAL DATA, SERIES A MONOGRAPHS. VOLUME 2, NO. 4: NUMERIC SIMULATION OF APPROXIMATELY BIANNUAL OSCILLATION OF MIDDLE ZONE WIND IN EQUATORIAL STRATOSPHERE Ph.D. Thesis [METEOROLOGISCHE ABHANDLUNGEN, SERIE A MONOGRAPHIEN. BAND 2, HEFT 4: DIE NUMERISCHE SIMULATION DER NAHEZU ZWEIJAEHRIGEN SCHWINGUNG DES MITTLEREN ZONALEN WINDES IN DER AEQUATORIALEN STRATOSPHAERE]**
Ernst Klinker Feb. 1981 139 p refs In GERMAN
(ISSN-0342-4324) Copyright. Avail: Issuing Activity

Dynamics of the middle stratosphere during winter are described with the help of householder equations for angular momentum and its square. R.J.F.

N83-18147# Finnish Meteorological Inst., Helsinki.
**AERONAUTICAL CLIMATOLOGICAL TABLES AT TAMPERE AIRPORT, 1 DECEMBER 1961 - 30 NOVEMBER 1966**
Ilona Soini 1982 42 p In FINNISH and in ENGLISH
(Tutkimusseloste-100; ISBN-951-697-175-X; ISSN-0355-1717) Avail: NTIS HC A03/MF A01

Distributions of visibility and ceiling, surface wind, unfavorable flight conditions, temperature, and hydrometeors for Tampere Airport, Finland are tabulated. N.W.

N83-18148# Finnish Meteorological Inst., Helsinki.
**AERONAUTICAL CLIMATOLOGICAL TABLES AT KEMI AIRPORT, 1 DECEMBER 1961 - 30 NOVEMBER 1966**
Ilona Soini 1982 42 p In FINNISH and in ENGLISH
(Tutkimusseloste-92; ISBN-951-697-167-9; ISSN-0355-1717) Avail: NTIS HC A03/MF A01

Aeronautical climatological tables are made in accordance with international regulations agreed by the International Civil Aviation Organization and World Meteorological Organization. Climatological tables included are made according to WMO summary models A, B and C. In additions to these there are also tables giving distributions of dry bulb temperature and hydrometeors. Some of the distributions are also presented in graphical form. L.F.M.

N83-18149# Finnish Meteorological Inst., Helsinki.
**METEOROLOGICAL YEARBOOK OF FINLAND, VOLUME 76, PART 1B: CLIMATOLOGICAL DATA FROM JOKIOINEN AND SODANKYLA OBSERVATORIES, 1976**
1982 51 p In FINNISH and ENGLISH
(ISBN-951-697-181-4; ISSN-0076-6739) Avail: NTIS HC A04/MF A01

The meteorological observations was by the Jokioinen and Sodankyla observatories in 1976 are summarized. The recorded momentary values of the atmospheric pressure, temperature and relative humidity at even hours, the hourly mean values of the wind direction and wind speed, momentary observations of the total cloud cover, the forms of clouds and the height of the cloud base, meteors observed with time of appearance and the observation of precipitation, visibility and snow depth are given. Author

N83-18150# Finnish Meteorological Inst., Helsinki.
**A COMPARISON OF HUMIDITY MEASUREMENTS MADE WITH A PSYCHOMETER, A HAIR HYGROMETER AND A THIN FILM HUMIDITY SENSOR**
Kari Ahti, Tuomo Sankola, and Juhani Heikkinen Apr. 1982 26 p refs
(TR-27; ISBN-951-697-184-9; ISSN-0355-1733) Avail: NTIS HC A03/MF A01

Observations, made in natural conditions at the Kaisaniemi synoptic station in Helsinki, from thin film humidity sensors were compared with those made with a psychrometer. At the same time collection was made of observations from a Lambrecht hair hygrometer, which is used in Finland as a secondary meter. The standard deviation of the differences in the observations was on average below 2%, measured in units of relative humidity. The scatter remained the same throughout the year's observation period. With regard to the hair hygrometer, results show that for values of relative humidity below 70%, it gave values which were on average 2 to 3% units drier than those of the psychrometer. At high values of relative humidity no significant differences were observed. Author

N83-18151# Finnish Meteorological Inst., Helsinki.
**AERONAUTICAL CLIMATOLOGICAL TABLES AT VAASA AIRPORT, 1 DECEMBER 1962 - 30 NOVEMBER 1966**
Ilona Soini 1982 42 p In FINNISH and in ENGLISH
(Tutkimusseloste-102; ISBN-951-697-177-6; ISSN-0355-1717) Avail: NTIS HC A03/MF A01

Distributions of visibility and ceiling, surface wind, unfavorable flight conditions, temperature, and hydrometeors for Vaasa Airport, Finland are tabulated. N.W.

N83-18152# Finnish Meteorological Inst., Helsinki.
**HOW TO IMPROVE THE FINNISH WEATHER FORECASTS**
Juhanni Rinne 1982 63 p In FINNISH; ENGLISH summary
(Tutkimusseloste-103; ISBN-951-697-179-2; ISSN-0355-1717) Avail: NTIS HC A03/MF A01

The question 'how to improve the Finnish weather forecasts' was studied applying the Delphi technique. In spite of the generality of the question, the technique turned out to be usable. The answering groups had a meteorological background. They presented a number of ideas concerning the improvement of the 0-2 d public forecasts. The groups felt the following ideas to be most important: give more education to the forecasters, establish a unit for the study and verification of the forecasts, start local weather services and give radar pictures to the forecasting center. The development of computer products was generally felt to be less important. Many ideas reflect the education or the position of the answering groups. Author

N83-18153# Finnish Meteorological Inst., Helsinki.
**AERONAUTICAL CLIMATOLOGICAL TABLES AT TURKU AIRPORT, 1 DECEMBER 1960 - 30 NOVEMBER 1965**
Ilona Soini 1982 42 p In FINNISH and in ENGLISH
(Tutkimusseloste-101; ISBN-951-697-176-8; ISSN-0355-1717) Avail: NTIS HC A03/MF A01

Distributions of visibility and ceiling, surface wind, unfavorable flight conditions, temperature, and hydrometeors for Turku Airport, Finland are tabulated. N.W.

N83-18154# Finnish Meteorological Inst., Helsinki.
**AERONAUTICAL CLIMATOLOGICAL TABLES AT PORI AIRPORT, 1 DECEMBER 1961 - 30 NOVEMBER 1966**
Ilona Soini 1982 42 p In FINNISH and in ENGLISH

(Tutkimusseloste-98; ISBN-951-697-173-3; ISSN-0355-1717) Avail: NTIS HC A03/MF A01

Distributions of visibility and ceiling, surface wind, unfavorable flight conditions, temperature, and hydrometeors for Pori Airport, Finland are tabulated. N.W.

**N83-18155#** Finnish Meteorological Inst., Helsinki.
**AERONAUTICAL CLIMATOLOGICAL TABLES AT ROVANIEMI AIRPORT, 1 DECEMBER 1961 - 30 NOVEMBER 1966**
Ilona Soini 1982 42 p In FINNISH and in ENGLISH
(Tutkimusseloste-99; ISBN-951-697-174-1; ISSN-0355-1717) Avail: NTIS HC A03/MF A01

Distributions of visibility and ceiling, surface wind, unfavorable flight conditions, temperature, and hydrometeors for Rovaniemi Airport, Finland are tabulated. N.W.

**N83-18156#** Finnish Meteorological Inst., Helsinki.
**AERONAUTICAL CLIMATOLOGICAL TABLES AT KRUUNUNKYLAE AIRPORT, 1 DECEMBER 1961 - 30 NOVEMBER 1966**
Ilona Soini 1982 43 p In FINNISH and in ENGLISH
(Tutkimusseloste-93; ISBN-951-697-168-7; ISSN-0355-1717) Avail: NTIS HC A03/MF A01

Distributions of visibility and ceiling, surface wind, unfavorable flight conditions, temperature, and hydrometeors for Kruununkylae Airport, Finland are tabulated. N.W.

**N83-18157#** Finnish Meteorological Inst., Helsinki.
**AERONAUTICAL CLIMATOLOGICAL TABLES AT KUOPIO AIRPORT, 1 DECEMBER 1962 - 30 NOVEMBER 1966**
Ilona Soini 1982 42 p In FINNISH and in ENGLISH
(Tutkimusseloste-94; ISBN-951-697-169-5; ISSN-0355-1717) Avail: NTIS HC A03/MF A01

Distributions of visibility and ceiling, surface wind, unfavorable flight conditions, temperature, and hydrometeors for Kuopio Airport, Finland are tabulated. N.W.

**N83-18158#** Finnish Meteorological Inst., Helsinki.
**AERONAUTICAL CLIMATOLOGICAL TABLES AT LAPPENRANTA AIRPORT, 1 DECEMBER 1962 - 30 NOVEMBER 1966**
Ilona Soini 1982 46 p In FINNISH and in ENGLISH
(Tutkimusseloste-95; ISBN-951-697-170-9; ISSN-0355-1717) Avail: NTIS HC A03/MF A01

Distributions of visibility and ceiling, surface wind, unfavorable flight conditions, temperature, and hydrometeors for Lappeeuvanta Airport, Finland are tabulated. N.W.

**N83-18159#** Finnish Meteorological Inst., Helsinki.
**AERONAUTICAL CLIMATOLOGICAL TABLES AT MAARIANHAMINA AIRPORT, 1 DECEMBER 1961 - 30 NOVEMBER 1966**
Ilona Soini 1982 42 p In FINNISH and in ENGLISH
(Tutkimusseloste-96; ISBN-951-697-171-7; ISSN-0355-1717) Avail: NTIS HC A03/MF A01

Distributions of visibility and ceiling, surface wind, unfavorable flight conditions, temperature, and hydrometeors for Maavianhamina Airport, Finland are tabulated. N.W.

**N83-18160#** Finnish Meteorological Inst., Helsinki.
**AERONAUTICAL CLIMATOLOGICAL TABLES AT OULU AIRPORT, 1 DECEMBER 1961 - 30 NOVEMBER 1966**
Ilona Soini 1982 47 p refs In FINNISH and in ENGLISH
(Tutkimusseloste-97; ISBN-951-697-172-5; ISSN-0355-1717) Avail: NTIS HC A03/MF A01

Distributions of visibility and ceiling, surface wind, unfavorable flight conditions, temperature, and hydrometeors for Oulu Airport, Finland are tabulated. N.W.

**N83-18161#** Finnish Meteorological Inst., Helsinki.
**AERONAUTICAL CLIMATOLOGICAL TABLES AT KAJAANI AIRPORT, 1 DECEMBER 1961 - 30 NOVEMBER 1966**
Ilona Soini 1982 42 p In FINNISH and in ENGLISH
(Tutkimusseloste-91; ISBN-951-697-166-0; ISSN-0355-1717) Avail: NTIS HC A03/MF A01

Distributions of visibility and ceiling, surface wind, unfavorable flight conditions, temperature, and hydrometeors for Kajaani Airport, Finland are tabulated. N.W.

**N83-18162#** Finnish Meteorological Inst., Helsinki.
**AERONAUTICAL CLIMATOLOGICAL TABLES AT JYVAESKYLAE AIRPORT, 1 DECEMBER 1961 - 30 NOVEMBER 1966**
Ilona Soini 1982 42 p In FINNISH and in ENGLISH
(Tutkimusseloste-90; ISBN-951-697-165-2; ISSN-0355-1717) Avail: NTIS HC A03/MF A01

Distributions of visibility and ceiling, surface wind, unfavorable flight conditions, temperature, and hydrometeors for Jyvaeskylae Airport, Finland are tabulated. N.W.

**N83-18163#** Finnish Meteorological Inst., Helsinki.
**AERONAUTICAL CLIMATOLOGICAL TABLES AT JOENSUU AIRPORT, 1 DECEMBER 1961 - 30 NOVEMBER 1966**
Ilona Soini 1982 42 p In FINNISH and in ENGLISH
(Tutkimusseloste-89; ISBN-951-697-164-4; ISSN-0355-1717) Avail: NTIS HC A03/MF A01

Distributions of visibility and ceiling, surface wind, unfavorable flight conditions, temperature, and hydrometeors for Joensuu Airport, Finland are tabulated. N.W.

**N83-18164#** Finnish Meteorological Inst., Helsinki.
**AERONAUTICAL CLIMATOLOGICAL TABLES AT IVALO AIRPORT, 1 DECEMBER 1962 - 30 NOVEMBER 1966**
Ilona Soini 1982 46 p In FINNISH and in ENGLISH
(Tutkimusseloste-88; ISBN-951-697-163-6; ISSN-0355-1717) Avail: NTIS HC A03/MF A01

Distributions of visibility and ceiling, surface wind, unfavorable flight conditions, temperature, and hydrometeors for Ivalo Airport, Finland are tabulated. N.W.

**N83-18165#** Finnish Meteorological Inst., Helsinki.
**AERONAUTICAL CLIMATOLOGICAL TABLES AT HELSINKI AIRPORT, 1 DECEMBER 1962 - 30 NOVEMBER 1966**
Ilona Soini 1982 43 p In FINNISH and in ENGLISH
(Tutkimusseloste-87; ISBN-951-697-162-8; ISSN-0355-1717) Avail: NTIS HC A03/MF A01

Distributions of visibility and ceiling, surface wind, unfavorable flight conditions, temperature, and hydrometeors for Helsinki Airport, Finland are tabulated. N.W.

**N83-18166#** National Oceanic and Atmospheric Administration, Washington, D. C.
**MARINERS WEATHER LOG, VOLUME 26, NUMBER 1**
Elwyn E. Wilson, ed. 1982 58 p refs
(ISSN-0025-3367) Avail: NTIS HC A04/MF A01

Adjustments for visual wave data, North Atlantic tropical cyclones, buoy measured mean wave heights, coastal stations accepting observations from ships, news, and marine weather data are presented. N.W.

**N83-18167#** National Oceanic and Atmospheric Administration, Washington, D. C.
**MARINERS WEATHER LOG, VOLUME 26, NUMBER 2**
Elwyn E. Wilson, ed. 1982 62 p
(ISSN-0025-3367) Avail: NTIS HC A04/MF A01

Tropical cyclones, ice observations on the Chesapeake Bay, transatlantic sailing, hurricane reporting, weather broadcast corrections, shipboard observations, news and marine weather data are provided. N.W.

**N83-18168#** National Oceanic and Atmospheric Administration, Washington, D. C.
**MARINERS WEATHER LOG, VOLUME 26, NUMBER 3**
Elwyn E. Wilson, ed. 1982 62 p refs
(ISSN-0025-3367) Avail: NTIS HC A04/MF A01

The Pride of Baltimore, severe buoy wave conditions, great lakes navigation, ship reports, weather broadcasts, marine observations and weather review, and news are reported. N.W.

**N83-18169#** National Oceanic and Atmospheric Administration, Washington, D. C.
**MARINERS WEATHER LOG, VOLUME 26, NUMBER 4**
Elwyn E. Wilson, ed. 1982 66 p
(ISSN-0025-3367) Avail: NTIS HC A04/MF A01

Pacific typhoons, shipboard environmental data acquisition system (SEAS), wind-chill chart, radiofacsimile in the Gulf of Mexico, marine observations and weather, and news are reported. N.W.

**N83-18170#** National Oceanic and Atmospheric Administration, Washington, D. C.
**MARINERS WEATHER LOG, VOLUME 25, NUMBER 4**
Elwyn E. Wilson, ed. and Annette Farrall, ed. Aug. 1981 77 p
(ISSN-0025-3367) Avail: NTIS HC A05/MF A01

Atlantic tropical cyclone forecast errors, Pacific typhoons, wind direction bias, radio tips, marine weather observations, hurricane data, and news are provided. N.W.

**N83-18171#** National Oceanic and Atmospheric Administration, Washington, D. C.
**MARINERS WEATHER LOG, VOLUME 25, NUMBER 6**
Elwyn E. Wilson, ed. and Annette Farrall, ed. Dec. 1981 58 p refs
(ISSN-0025-3367) Avail: NTIS HC A04/MF A01

Bore tides in upper Cook Inlet, icebreaker tugs, air temperature and dew point, marine observations and weather review, hurricanes, and news are discussed. N.W.

**N83-18172#** Technische Hochschule, Hanover (West Germany). Inst. fuer Meteorologie und Klimatologie.
**DESIGN AND STANDARDIZATION OF METEOROLOGICAL MEASUREMENTS FOR WIND ENERGY CONVERTING SYSTEMS Final Report, Nov. 1981**
Peter Arthur Ward Coppin, Gerd Tetzlaff, and Rainer Roth Bonn Bundesministerium fuer Forschung und Technologie Sep. 1982 66 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-82-168; ISSN-0340-7608) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 14

The systematic error for several standard anemometers was investigated. The efficiency of wind energy converters can only be measured if several requirements for the topographic forms, surface coverage, stationarity of the wind field and turbulence intensity are met. It is only then that the standard models describing wind field properties are applicable and errors do not exceed 3%. The wind speed sensors should not exhibit a systematic error. Under simplified conditions three anemometers are sufficient to get reliable data on the overall efficiency of almost every wind energy converting system. E.A.K.

**N83-18173#** World Meteorological Organization, Geneva (Switzerland).
**REPORT OF THE 3RD SESSION OF THE JOINT SCIENTIFIC COMMITTEE Global Atmospheric Research Program and World Climate Research Program**
1982 143 p refs Conf. held at Dublin, 8-15 Mar. 1982 Prepared in cooperation with International Council Scientific Unions, Rome Avail: NTIS HC A01; print copy available at WMO, Geneva

Various aspects of the Earth's climate are discussed. Weather, clouds, oceans, data management, hydrology, aerosols, and carbon dioxide impacts are discussed. R.J.F.

**N83-18174#** National Aerospace Lab., Amsterdam (Netherlands). Informatics Div.
**ON-LINE PROCESSING OF HIGH RESOLUTION IMAGERY FROM METEOROLOGICAL SATELLITES**
H. A. vanIngenSchenau 7 Jul. 1981 10 p refs Presented at 25th Intern. Tech. Symp. of the Soc. of Photo-Opt. Instrumentation Engr. (SPIE): Design of Digital Image Processing Systems, San Diego, 24-28 Aug. 1981 Sponsored by Hollandse Signaalapparaten and Netherlands Agency for Aerospace Programs (NIVR)
(NLR-MP-87039-U) Avail: NTIS HC A02/MF A01

An image processing system which produces in real time the high resolution HRPT imagery received from the TIROS-N/NOAA-6 satellites is discussed. The digital image processing is performed by a programmable pipeline processor under control of a P857 computer. The processing modules of the pipeline processor are dynamically loaded with transfer function data to calibrate the infrared data, to carry out the panoramic correction and to add the geographic grid and map accurately. The computer is part of an interactive system to input the processing parameters and the orbital data in a user oriented way. E.A.K.

**N83-18175#** Royal Netherlands Meteorological Inst., De Bilt.
**ON THE THEORY AND APPLICATION OF SIMPLE CLIMATE MODELS TO THE PROBLEM OF LONG RANGE WEATHER PREDICTION**
R. Mureau, ed., C. J. Kok, ed., and R. J. Haarsma, ed. 1982 138 p refs Presented at Roy. Neth. Meteorol. Inst. (KNMI) Workshop, De Bilt, Netherlands, 1-3 Mar. 1982
(KNMI-163) Avail: NTIS HC A07/MF A01

The usefulness of simple climate models in studying and eventually predicting climate variations on time scales of a month to a year was addressed. General topics included linear steady state models, multiple steady states in simple models, analysis of atmospheric eddies, and the relation between observations and the determination of predictability. For individual titles, see N83-18176 through N83-18186.

**N83-18176#** Royal Netherlands Meteorological Inst., De Bilt.
**WHAT DO OBSERVATIONS TELL ABOUT LONG RANGE PREDICTABILITY**
H. M. vandenDool *In its* On the Theory and Appl. of Simple Climate Models to the Probl. of Long Range Weather Prediction 1982 p 1-11 refs (For primary document see N83-18175 08-47)
Avail: NTIS HC A07/MF A01

Autocorrelations of observations as evidence of long range weather predictability is examined. Observations suggest that there is an interesting amount of potential predictability in the time mean surface air temperature in the coastal areas of the mid-latitudes. Away from the coasts there is much less potential predictability. For most other weather elements (rainfall, pressure) the situation seems to be worse. The major problem of long range predictions is the large effect of daily weather disturbances on the time mean. M.G.

**N83-18177#** Washington Univ., Seattle. Dept. of Atmospheric Sciences.
**ON THE NATURE AND CAUSES OF LOW FREQUENCY VARIABILITY**
J. M. Wallace *In* Roy. Neth. Meteorol. Inst. On the Theory and Appl. of Simple Climate Models to the Probl. of Long Range Weather Prediction 1982 p 13-18 ref (For primary document see N83-18175 08-47)
Avail: NTIS HC A07/MF A01

The characteristics of atmospheric motions of low frequency variability (> 15 days) are described and theoretical and observational results concerning possible causal mechanisms are reviewed. Prospects for long range forecasting are discussed. M.G.

**N83-18178#** Utrecht State Univ. (Netherlands). Inst. for Meteorology and Oceanography.
**SOME REMARKABLE ASPECTS OF THE ATMOSPHERIC CIRCULATION, WITH BEARING ON LONG RANGE FORECASTING**
C. J. E. Schuurmans *In* Roy. Neth. Meteorol. Inst. On the Theory and Appl. of Simple Climate Models to the Probl. of Long Range Weather Prediction 1982 p 19-30 refs (For primary document see N83-18175 08-47)
Avail: NTIS HC A07/MF A01

Results from a five year experiment in using circulation analogues in monthly weather forecasting are discussed. The items treated are: regime changes, month to month persistence, secular variations, and blocking. M.G.

**N83-18179#** European Centre for Medium-Range Weather Forecasts, Reading (England).
**TROPICAL INFLUENCES ON STATIONARY WAVE MOTION IN MIDDLE AND HIGH LATITUDES**
A. J. Simmons *In* Roy. Neth. Meteorol. Inst. On the Theory and Appl. of Simple Climate Models to the Probl. of Long Range Weather Prediction 1982 p 31-47 refs (For primary document see N83-18175 08-47)
Avail: NTIS HC A07/MF A01

Idealized models of stationary wave motion are examined. Attention is concentrated on the influence of the tropics on middle and high latitude. A steady, linear, primitive equation model illustrates the sensitivity of extratropically forced wave motion to tropical boundary conditions, and indicates the extratropical response to tropical forcing. In the latter case an isolated tropical region of diabatic heating may excite a wavetrain with a substantial poleward direction of propagation. The sensitivity of this response is discussed. Specifying the tropical forcing by means of a relaxation towards climatology results in a large extratropical response. Barotropic experiments were performed in which an isolated tropical forcing is superimposed on a constant forcing which maintains a climatological basic flow with zonal variation. In these cases a large response is found in the North Pacific region, and to a lesser extent the North Atlantic region, particularly when the forcing is located to the south of the region of strongest flow. Nonlinearity amplifies or damps this response depending on the sign of the forcing. Maintenance of a region of tropical westerly wind of limited zonal extent results in a substantial cross equatorial propagation. M.G.

**N83-18180#** Royal Netherlands Meteorological Inst., De Bilt.
**ON THE IMPORTANCE OF THE HADLEY CIRCULATION FOR CROSS EQUATORIAL PROPAGATION OF STATIONARY ROSSBY WAVES**
J. D. Opsteegh *In its* On the Theory and Appl. of Simple Climate Models to the Probl. of Long Range Weather Prediction 1982 p 49-57 refs (For primary document see N83-18175 08-47)
Avail: NTIS HC A07/MF A01

The ability of stationary Rossby waves to cross a region of equatorial easterlies is investigated, assuming that they are linear perturbations of a nonzonally varying basic flow. The basic flow consists of zonal mean, zonal, meridional and vertical winds, temperature, and static stability. Emphasis is given to the importance of the Hadley circulation for the spherical response to a local heat source. M.G.

**N83-18181#** Royal Netherlands Meteorological Inst., De Bilt.
**PRELIMINARY RESULTS OF A CHEAP MODEL TO FORECAST THE OCEAN SURFACE TEMPERATURE ANOMALIES**
Reinert J. Haarsma *In its* On the Theory and Appl. of Simple Climate Models to the Probl. of Long Range Weather Prediction 1982 p 59-67 refs (For primary document see N83-18175 08-47)
Avail: NTIS HC A07/MF A01

The changes in the spatial distribution of the monthly mean sea surface temperature anomalies for the North Pacific and Atlantic oceans were simulated with a mixed layer model. Advection of normal temperatures by anomalous wind driven currents and horizontal diffusion of the anomalies is considered. Averaged over a year there is some skill over persistence, mainly due to the diffusion term. In one case of strong windforcing the model performed much better than persistence. M.G.

**N83-18182#** European Centre for Medium-Range Weather Forecasts, Reading (England).
**NONLINEAR OROGRAPHIC EFFECTS AND BIFURCATION PROPERTIES**
Erland Kallen *In* Roy. Neth. Meteorol. Inst. On the Theory and Appl. of Simple Climate Models to the Probl. of Long Range Weather Prediction 1982 p 69-85 refs (For primary document see N83-18175 08-47)
Avail: NTIS HC A07/MF A01

The bifurcation properties of low order models with orographic and thermal or direct vorticity forcing are reviewed. The low order model results, that multiple equilibria develop as a result of a sufficiently strong orographic forcing and that a suitably positioned wave vorticity forcing can enhance this bifurcation mechanism, are verified with a high resolution, spectral model. The effects of baroclinic eddies in connection with orographic forcing is also discussed. M.G.

**N83-18183#** Technische Universitaet, Munich (West Germany). Meteorologisches Inst.
**STOCHASTIC FORCING IN HIGHLY TRUNCATED GCMS**
J. Egger *In* Roy. Neth. Meteorol. Inst. On the Theory and Appl. of Simple Climate Models to the Probl. of Long Range Weather Prediction 1982 p 87-98 refs (For primary document see N83-18175 08-47)
Avail: NTIS HC A07/MF A01

The possibility of making long range forecasts using highly truncated general circulation models is discussed. M.G.

**N83-18184#** Bonn Univ. (West Germany). Meteorologisches Inst.
**LOW ORDER STEADY CLIMATE MODELS**
Michael Hantel *In* Roy. Meth. Meteorol. Inst. On the Theory and Appl. of Simple Climate Models to the Probl. of Long Range Weather Predictions 1982 p 99-111 refs (For primary document see N83-18175 08-47)
Avail: NTIS HC A07/MF A01

Climate models after projection into phase space are addressed. The concepts applied in this field (existence of steady solutions; stability with respect to infinitesimal, finite, structural changes; sensitivity; response; numerical solution) are exemplified in terms of Riccati's differential equation for one spectral component. The pertinent analytic solution is compared with Lorenz's (1964) equivalent numerical solution. The concept of linear response is further demonstrated for the equations of the zonal mean global circulation. A 3 component version is gained by projection upon the observed climate functions (the zonal wind, mass streamfunction, temperature); climate changes are only possible through intensity changes. A 162 component version is gained by projection upon spectral expansions (3 in time, 6 in latitude, 3 in altitude) of the observed atmospheric functions. Climate changes include structural changes. This is demonstrated for 10% increases of the diabatic heating and the zonal wind eddies. M.G.

**N83-18185#** Reading Univ. (England). Atmospheric Modelling Group.
**ON THE INTERACTION BETWEEN LONG WAVE MOTION AND SYNOPTIC EDDIES**
Brian J. Hoskins *In* Roy. Neth. Meteorol. Inst. On the Theory and Appl. of Simple Climate Models to the Probl. of Long Range Weather Prediction 1982 p 113-117 refs (For primary document see N83-18175 08-47)
Avail: NTIS HC A07/MF A01

The question of whether the synoptic time scale eddies play any crucial role in the low frequency motions of the atmosphere is discussed. The consequence of different eddy shapes for the eddy flux convergence of vorticity is expressed in terms of an anisotropy vector. M.G.

**N83-18186#** Helsinki Univ. (Finland). Dept. of Meteorology.
**ON THE RELATIONSHIPS BETWEEN MEAN FLOW AND TRANSIENT EDDY ENERGY FLUX DIVERGENCIES, COMPUTED ON A MONTHLY BASIS**
Mikko Alestalo *In* Roy. Neth. Meteorol. Inst. On the Theory and Appl. of Simple Climate Models to the Probl. of Long Range Weather Forecasting 1982 p 119-129 refs (For primary document see N83-18175 08-47)
Avail: NTIS HC A07/MF A01

A 96 month time series of monthly means and covariances of temperature and geopotential height and wind components at different atmospheric levels and stations in Europe were used for the computation of the monthly mean values of vertically integrated flux divergences of sensible heat and potential energy. The total

flux divergence was partitioned into contributions due to transient flow systems and the monthly mean flow. It is found that the individual monthly anomalies of these two contributions have a tendency to partly cancel each other. The year to year variability of these terms is large. In the budget equation of sensible heat the rate of time change of energy storage appears to be a small residual between atmospheric large scale net transports and diabatic effects, which act opposite to each other. The effect of transient eddies on temperature anomalies is found to be a dissipative one. M.G.

**N83-18187#** Stockholm Univ. (Sweden). Dept. of Meteorology.
**A PARAMETERIZATION SCHEME FOR CONVECTIVE CLOUD WATER AND CLOUD COVER**
Ulla Hammarstrand Aug. 1982 35 p refs
(Contracts NFR-G-UR-2923-102; NFR-G-GU-2923-104)
(DM-40; ISSN-0349-0467) Avail: NTIS HC A03/MF A01

A parameterization scheme for convective cloud water and cloud cover was developed. The scheme is formulated to be used in conjunction with the penetrative convection scheme. It is implemented in a one dimensional forecast model to perform experimental forecasts. The results from forecasts with different values on the parameters of the scheme are studied. The predicted heat, moisture, cloud cover and cloud water content depend on the choice of values of three unknown model parameters. It is noted that the variations with heights of the predicted variables seem to be qualitatively realistic. E.A.K.

**N83-18188#** European Space Operations Center, Darmstadt (West Germany).
**METEOSAT IMAGE BULLETIN, MARCH 1982**
Apr. 1982 59 p
Avail: NTIS HC A04/MF A01

Earth photographs and data tables indicating the dates and times of the images are given. R.J.F.

# 48 OCEANOGRAPHY

Includes biological, dynamic and physical oceanography; and marine resources.

**N83-18189#** Stockholm Univ. (Sweden). Dept. of Meteorology.
**THE SIMULTANEOUS USE OF TRACERS FOR OCEAN CIRCULATION STUDIES**
Bert Bolin, Anders Bjoerkstroem, Kim Holmen, and Berrien Moore (New Hampshire Univ.) 1 Sep. 1982 75 p refs
(Contract NFR-E-EG-223-111; Grant NSF DEB-81-10477)
(CM-58; ISSN-0280-445X) Avail: NTIS HC A04/MF A01

A method for the simultaneous use of tracers for oceanic circulation studies is developed. To permit the inclusion of tracers that are subject to biochemical transformation a simple model for photosynthesis, bacterial decomposition and chemical dissolution is formulated based on the use of Redfield ratios for the chemical compounds' interaction. The finite difference analogue to the steady state tracer continuity equation, applied to the tracers chosen, leads to a set of simultaneous algebraic equations that in principle can be solved by matrix inversion methods. Two cases are considered. The problem is indeterminate, which may be the case when too few tracers are available and/or some tracer equations are redundant. A solution is obtained by minimizing the transport vector. The problem is incompatible, which may result from making use of many tracers. A solution is obtained by minimizing the errors in satisfying the tracer continuity equations. Author

**N83-18190#** Skidaway Inst. of Oceanography, Savannah, Ga.
**COORDINATION: SOUTHEAST CONTINENTAL SHELF STUDIES**
21 Dec. 1981 42 p refs
(Contract DE-AS09-76EV-00901)
(DE82-005161; DOE/EV-00901/T4) Avail: NTIS HC A03/MF A01

The oceanography of the South Atlantic Bight was investigated during the period of 1976 to 1981. Included is a complete index to publications and reports which describe the results in detail. DOE

# 51 LIFE SCIENCES (GENERAL)

Includes genetics.

**N83-18191#** Army Medical Intelligence and Information Agency, Washington, D. C.
**MILITARY MEDICAL JOURNAL, NO. 8, AUGUST 1982**
Aug. 1982 144 p refs Transl. into ENGLISH of Voenno-Med. Zh. (Moscow), no. 8, Aug. 1982 81 p
(L-2130) Avail: NTIS HC A07/MF A01

Increasing the working capacity of persons subject to extended sensory overloads and therapeutic-prophylactic measures in eye diseases among flight personnel are discussed. For individual titles, see N83-18192 through N83-18193.

**N83-18192#** Army Intelligence and Threat Analysis Center, Arlington, Va.
**MEANS FOR INCREASING THE WORKING CAPACITY OF PERSONS SUBJECT TO EXTENDED SENSORY OVERLOADS** **c53**
G. I. Alekseyev, D. V. Gusarov, and Yu. A. Sobolin *In its* Mil. Med. J., No. 8, August 1982 Aug. 1982 56-60 refs Transl. into ENGLISH from Voyenno-Med. Zh. (Moscow), no. 8, 1982 p 38-40 (For primary document see N83-18191 08-51)
Avail: NTIS HC A07/MF A01

Means for physiological stimulation of the activity of the nervous system in cases of sensory overload were studied. The influence of stimulus of the upper respiratory tract with ammonia on the function of the visual analyzer of man and on muscular fatigue was tested. The functional status of the visual analyzer was evaluated by determining the critical merging frequency of light flashes (CFLF) and the throughput capacity of the analyzer. Author

**N83-18193#** Army Intelligence and Threat Analysis Center, Arlington, Va.
**THERAPEUTIC-PROPHYLATIC MEASURES IN DISEASES OF THE ORGAN OF VISION AMONG FLYING PESONNEL** **c52**
L. M. Asyyev *In its* Mil. Med. J., No. 8, August 1982 Aug. 1982 p 61-64 refs Transl. into ENGLISH from Voyenno-Med. Zh. (Moscow), no. 8, 1982 p 41-42 (For primary document see N83-18191 08-51)
Avail: NTIS HC A07/MF A01

Among persons with various flight specialties the following states and diseases of the eyes requiring particular attention of ophthalmologists were most frequently seen: slight degrees of refractory anomalies (myopia, hypermetropia, astigmatism), slight disorders of accommodation (presbyopia, false myopie), inflammatory disease of the conjunctiva and edges of the lids (chronic conjuctivitis, blepharitis, blepharoconjunctivitis) cornea and internal envelopes of the eye (keratitis, irridocyclitis, chorioretinitis), as well as the after effects of these diseases. Author

**N83-18194#** University Coll., Cardiff (Wales). Dept. of Applied Mathematics and Astronomy.
**AN ESSAY ON GENETICS**
Fred Hoyle and N. Chandra Nickramasinghe Apr. 1982 46 p ref Submitted for publication
(Preprint-76) Avail: NTIS HC A03/MF A01

For definiteness, we take the model to have a constant population of N individuals with N a large even number, say N = 10,000. One half of the population is to be female with the same X chromosomes, while the males all have the same X chromosomes as the females and the same Y chromosomes among themselves. The other chromosomes are homozygous except for a single gene, A, which will be taken to be neutral to survival in the first part of this essay. Divide the N individuals into N/2 mating pairs, the associations being random. Let each such pair have

two surviving offspring that regenerate the population in the next generation, with the number of males and females maintained equal (in the manner specified below). Then continue from generation to generation in the same way. Author

**N83-18195#** University Coll., Cardiff (Wales). Dept. of Applied Mathematics and Astronomy.
**PROOFS THAT LIFE IS COSMIC**
Fred Hoyle and N. Chandr Wickramasinghe Aug. 1982 292 p refs Submitted for publication
(Preprint-83) Avail: NTIS HC A13/MF A01

The theory that life is cosmic is argued. Different aspects of this argument are presented in relation to the atmosphere, bacteria, comets, diseases, evolution, interstellar grains, meteorites, origin of life, and planets. S.L.

**N83-18196#** Deutsches Inst. fuer Medizinische Dokumentation und Information, Cologne (West Germany).
**USER ORIENTED SUPPLY OF INFORMATION BY DEVELOPMENT AND OPERATION OF AN INFORMATION AND COMMUNICATION NETWORK REALIED IN THE FIELD OF THE LIFE SCIENCES: DIMDINET Final Report, Jul. 1981**
Rolf Fritz, Ralf George, Hans Juergen Gesenberg, Hans-Eberhard Kurzwelly, and Gerold Piate Bonn Bundesministerium fuer Forschung und Technologie Oct. 1982 138 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-ID-82-006; ISSN-0170-8996) Avail: NTIS HC A07/MF A01; Fachinformationszentrum, Karsruhe, West Germany DM 29

Final report on the development and the operation of the information and communication-network DIMDINET for the online usage of databases by decentralized information service centres (ISC) in the field of biomedicine (life sciences). Actions to be taken, problems and experiences encountered when setting up the infrastructure for the ISC are described. The results of the project DIMDINET related to activating and covering the information needs are displayed in extensive statistical data. The technical part shows the stepwise setup and operation of a private data network; lists the resulting consequences and includes the linkage to EURONET and DATEX-P. Also included is a detailed cost comparison between the data networks DIMDINET, EURONET and DATEX-P. Quantitative and qualitative data for planning may be derived from the results and experiences for setting up further ICS and for installing appropriate services in other infrastructures of the information community. The experiences gathered by DIMDI undertaking the pilot study have been fed back into various advisory groups for further planning and decision processes of various areas of the GERMAN and EUROPEAN information community. Author

**N83-18197#** Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
**EFFECT OF PARTIAL RESTRAINT OF MOTOR ACTIVITY ON BASIC PHYSIOLOGICAL PROCESSES IN MONKEYS**
I. D. Bogina, N. A. Rokotova, Ye. S. Rogovenko, and R. L. Sheykin 23 Aug. 1982 13 p refs Transl. into ENGLISH from Probl. Kosmich. Biol. (USSR), no. 4, 1965 p 308-315
(AD-A120578; FTD-ID(RS)T-1127-82) Avail: NTIS HC A02/MF A01 CSCL 06/3

The physiological effects and functional state of monkey's nervous system of partial restraint of motor activity were investigated. It is found that chronic fication has advantages over the movement restraint for short periods. It is shown that animals under prolonged motor activity conditions are useful in the study of space biology and physiology. GRA

**N83-18198#** Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
**THE EFFECT OF PROLONGED RESTRAINT OF MOTOR ACTIVITY ON THE VITAL ACTIVITY OF MONKEYS**
N. A. Rokotova, P. D. Bogina, O. P. Bolotina, T. M. Kucherenko, Ye. S. Rogovenko, and R. L. Sheykin 26 Aug. 1982 15 p refs Transl. into ENGLISH from Probl. Kosmich. Biol. (USSR), no. 2, 1962 p 417-427
(AD-A120479; FTD-ID(RS)T-1128-82) Avail: NTIS HC A02/MF A01 CSCL 06/3

Factors affecting human physiology in extended space flights are discussed. The long term effects of restrained motor activity were studied. The physiological effects of a prolonged restraint on monkey behavior was evaluated. It is found that: (1) prolonged restraint of motor activity does not affect vital activity; (2) monkeys in fixed conditions can be used for further studies; (3) the fixator design for chronic restraint of monkey mobility ensures a long term sustaining of the animal's normal physiological state. GRA

**N83-18199#** Utah State Univ., Logan.
**BIOENERGETICS OF THE METHANOGENIC BACTERIA Annual Progress Report, 15 Mar. 1981 - 14 Mar. 1982**
J. R. Lancaster, Jr. Jan. 1982 10 p refs
(Contract DE-AC02-81ER-10875)
(DE82-010475; DOE/ER-10875/1) Avail: NTIS HC A02/MF A01

By the use of nickel-61, a previously observed electron paramagnetic resonance signal present in Methanobacterium bryantii was identified as nickel in an environment of strong octahedral coordination. This is a new biological paramagnetic center and is the first observation by EPR spectroscopy of nickel in a biological system. Other electron transfer components were identified: (1) each of six species of methanogen contain HiPiP-type iron-sulfur centers, which could be due to hydrogenase; (2) flavin adenine dinucleotide was detected in preparations of M. bryantii, and a membrane associated flavoprotein was solubilized; (3) coorin is also associated with the particulate fraction. A soluble hydrogenase was isolated and partially purified. DOE

**N83-18200#** Joint Publications Research Service, Arlington, Va.
**USSR REPORT: SPACE BIOLOGY AND AEROSPACE MEDICINE, VOLUME 16, NO. 6, NOVEMBER - DECEMBER 1982**
O. G. Gazenko, ed. 17 Jan. 1983 154 p refs Transl. into ENGLISH of Kosmich. Biol. i Aviakosmich. Med. (Moscow), v.16, no. 6, Nov. - Dec. 1982 96 p
(JPRS-82654) Avail: NTIS HC A08/MF A01

Various topics in aerospace medicine and space biology are discussed. Weightlessness, hypokinesia, space suits, protein metabolism, psychophysiology, submersion effects, and life support systems are among the topics discussed. For individual titles, see N83-18201 through N83-18225.

**N83-18201#** Joint Publications Research Service, Arlington, Va.
**SPACE MEDICINE BENEFITS TO SCIENCE AND HEALTH CARE** **c52**
B. S. Alyakrinskiy *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 6, Nov. - Dec. 1982 (JPRS-82654) 17 Jan. 1983 p 1-4 Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 16, no. 6, Nov. - Dec. 1982 p 4-6 (For primary document see N83-18200 08-51)
Avail: NTIS HC A08/MF A01

The problems of weightlessness and hypokinesia are discussed in the context of a very general review of the problems of aerospace medicine. R.J.F.

**N83-18202#** Joint Publications Research Service, Arlington, Va.
**THE EARLY STAGE OF DEVELOPMENT OF COSMONAUTICS IN THE USSR (1917-1945)** **c12**
Ye. P. Tolmachev *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 6, Nov. - Dec. 1982 (JPRS-82654) 17 Jan. 1983 p 5-17 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 16, no. 6, Nov. - Dec. 1982 p 7-15 (For primary document see N83-18200 08-51)
Avail: NTIS HC A08/MF A01

The development of Soviet rocketry from 1917 to 1945 is discussed. The importance of aviation to the development of rocketry is stressed. The contributions of numerous groups and individuals are discussed. R.J.F.

**N83-18203#** Joint Publications Research Service, Arlington, Va.
**PHYSIOLOGICAL AND HYGIENIC ASPECTS OF IMPLEMENTA-**

**TION OF COSMONAUTS WORK IN ORBITAL FLIGHT** c52
I. P. Abramov, A. S. Barer, M. I. Vakar, L. G. Golovkin, V. P. Zinchenko, S. N. Filipenkov, R. Kh. Sharipov, and V. V. Shchigolev *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 6, Nov. - Dec. 1982 (JPRS-82654) 17 Jan. 1983 p 18-25 Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 16, no. 6, Nov. - Dec. 1982 p 16-22 (For primary document see N83-18200 08-51)
Avail: NTIS HC A08/MF A01

Physiological-hygienic evaluations of space suits, data of the pre-flight training and extravehicular activities of the Salyut-6 crew members are discussed. Changes in physiological parameters, energy expenditures, heat release and associated performance of the automatic life support system are discussed. Physiological-hygienic aspects of the extravehicular activity of the Salyut-6 crew members are discussed. R.J.F.

**N83-18204#** Joint Publications Research Service, Arlington, Va.
**CHANGES IN VOLUME OF PLASMA, EXTRACELLULAR FLUID AND PLASMA PROTEIN MASS DURING ANTIORTHOSTATIC HYPOKINESIA AND IMMERSION** c52
A. M. Chayka and I. S. Balakhovskiy *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 6, Nov. - Dec. 1982 (JPRS-82654) 17 Jan. 1983 p 26-34 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 16, no. 6, Nov. - Dec. 1982 p 22-28 (For primary document see N83-18200 08-51)
Avail: NTIS HC A08/MF A01

The fate and role of plasma proteins in the regulation of the intravascular volume and fluid redistribution are discussed. Twenty-four young volunteers were experimental runs. The purpose was to measure volumes of plasma and extracellular fluid, as well as concentrations of plasma proteins and hemoglobin. The results varied but in most cases the plasma volume decreased by 0.446 to 0.55 l, extra-cellular fluid volume by 0.75 to 2.15 l, and plasma proteins by 13.4 to 30.4 g. The hemoglobin concentration increased by 8 to 12% and that of plasma proteins in some cases grew and in others diminished. Water loading prevented the plasma volume decreases. R.J.F.

**N83-18205#** Joint Publications Research Service, Arlington, Va.
**EFFECT OF SYDNOCARB ON CARDIORESPIRATORY SYSTEM DURING SEVEN-DAY WATER IMMERSION AND EXERCISE** c52
O. D. Anashkin and S. M. Belyayev *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 6, Nov.-Dec. 1982 (JPRS-82654) 17 Jan. 1983 p 35-40 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 16, no. 6, Nov. - Dec. 1982 p 35-40 (For primary document see N83-18200 08-51)
Avail: NTIS HC A08/MF A01

To study physiological effects of weightlessness, 12 male volunteers, aged 25-33, were exposed to 7-day water immersion. The test subjects were divided into two groups of 6 in each: the first group subjects were given a new Soviet stimulant sydnocarb (3-(beta-phenylisopropyl)-N-phenylcarbamoyl sydnonimine) and the second group subjects were given a placebo, using the double-blind method. To evaluate the cardio-respiratory function, the test subjects exercised on a bicycle ergometer before and after water immersion. During exercises ECG, heart rate, minute respiration volume, oxygen consumption, carbon dioxide production, cardiac output and oxygen pulse were recorded. The test subjects on the placebo showed a significant decrease of oxygen consumption at maximum workload. Those who were given sydnocarb maintained normal oxygen consumption during bicycle ergometry. The drug increased the workload per kg body weight, maintained physical work capacity, and improved the cardiovascular function after immersion. Author

**N83-18206#** Joint Publications Research Service, Arlington, Va.
**HUMAN EQUILIBRIUM DURING ROTATION AT DIFFERENT LEVELS OF HYPERGRAVITY** c52
A. R. Kotovskaya, L. N. Gavrilova, R. R. Galle, F. Glavacka, M. Schalling, and P. Duda *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 6, Nov. - Dec. 1982 (JPRS-82654) 17 Jan. 1983 p 41-44 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 16, no. 6, Nov. - Dec. 1982 p 32-34 (For primary document see N83-18200 08-51)
Avail: NTIS HC A08/MF A01

The gravity (of up to 2 g) effect on the upright stability of 16 test subjects exposed either to centrifugation or to artificially increased body weight (with uniformly distributed loading) is discussed. During centrifugation the stabilographic parameters increased significantly at every gravity level. In the experiments with artificially increased body weight the area of the vector stabilograms also increased significantly. The comparison of the two experimental runs suggests that disorders in the upright stability are caused by the rotation factor rather than by the artificially increased body weight. R.J.F.

**N83-18207#** Joint Publications Research Service, Arlington, Va.
**ENERGETIC REACTIONS IN RAT SKELETAL MUSCLES AFTER SPACEFLIGHT ABOARD COSMOS-936 BIOSATELLITE**
E. S. Mailyan, L. B. Buravkova, and L. V. Kokoreva *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 6, Nov. - Dec. 1982 (JPRS-82654) 17 Jan. 1983 p 45-49 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 16, no. 6, Nov. - Dec. 1982 p 34-37 (For primary document see N83-18200 08-51)
Avail: NTIS HC A08/MF A01

The respiration of mitochondria isolated from mixed skeletal muscles of hindlimbs of rats flown for 18.5 days on Cosmos-936 was investigated polarographically. At 10 hours the rate of mitochondrial respiration in different metabolic states during the oxidation of succinic acid and NAD-dependent substrates declined. The enzyme activity of mitochondrial cytochrome oxidase and cytosol lactate dehydrogenase diminished. At 25 days both aerobic and anaerobic oxidative processes increased, thus leading to the recovery of the parameters (sometimes they not only returned to the norm but exceeded it). Author

**N83-18208#** Joint Publications Research Service, Arlington, Va.
**ACTIVITY OF TRICARBOXYLIC ACID CYCLE OXIDATIVE ENZYMES IN SKELETAL MUSCLES OF HYPOKINETIC RATS**
Yu. A. Ganin *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 6, Nov. - Dec. 1982 (JPRS-82654) 17 Jan. 1983 p 50-55 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 16, no. 6, Nov. - Dec. 1982 p 37-41 (For primary document see N83-18200 08-51)
Avail: NTIS HC A08/MF A01

The study of 165 rats exposed to 60-day hypokinesia demonstrated a decrease in the quantity of mitochondrial protein and a decline in the activity of mitochondrial forms of NADP-isocitrate dehydrogenase (NADP-ICDH) and NAD-malate dehydrogenate (NAD-MDH), as well as NAD-ICDH, succinate dehydrogenase (SDH), and alpha-ketoglutarate dehydrogenase (alpha-KGDH). The maximum decline in the protein content was seen on day 60, and in the enzyme activity on day 7. As the hypokinetic exposure continued, the activity of mitochondrial NAD-MDH and NADP-ICDH slightly increased. The NADP-MDH activity decreased only at later stages of hypokinesia. The changes in cytoplasmic NAD-MDH, NADP-ICDH and NADP-MDH were less expressed. On day 25 of the recovery period the activity of NAD-ICDH and NADP-ICDH was significantly higher than in the controls, that of mitochondrial NAD-MDH returned to the normal, and the activity of SDH and alpha-KGDH remained noticeably lower. M.G.

**N83-18209#** Joint Publications Research Service, Arlington, Va.
**INCREASED RAT SENSITIVITY TO SO2 DURING LONG-TERM HYPOKINESIA**
A. I. Bokina, V. K. Fadeyeva, and Ye. M. Vikhrova *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 6, Nov. - Dec. 1982 (JPRS-82654) 17 Jan. 1983 p 56-60 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 16, no. 6, Nov.-Dec. 1982 p 41-45 (For primary document see N83-18200 08-51)

Avail: NTIS HC A08/MF A01

The effect of atmospheric contaminants on animals exposed to prolonged hypokinesia was investigated. A quantitative correlation between the resistance and the concentration of an atmosheric contaminant (sulfur oxide) was established, using concentration-time and concentration-effect relations. M.G.

**N83-18210#** Joint Publications Research Service, Arlington, Va.
**NYSTAGMIC REACTIONS OF RATS AFTER FLIGHT ABOARD COSMOS-1129 BIOSATELLITE**

A. A. Shipov and L. A. Tabakova *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 6, Nov. - Dec. 1982 (JPRS-82654) 17 Jan. 1983 p 61-65 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 16, no. 6, Nov. - Dec. 1982 p 45-48 (For primary document see N83-18200 08-51)

Avail: NTIS HC A08/MF A01

The vestibular nystagmus of rats flown for 18.5 days on Cosmos-1129 was examined with reference to the latent period, number of beats, duration, and the average velocity. The nystagmus was elicited by increasing angular acceleration of 10, 20, 30 deg/sec(2). As compared to the controls, the flown animals showed a significant inhibition of the nystagmic reaction ($P < 0.001$). The inhibition can be attributed to the desynchronosis which developed inflight. M.G.

**N83-18211#** Joint Publications Research Service, Arlington, Va.
**FLUID-ELECTROLYTE METABOLISM IN RATS IN DIFFERENT POSITIONS IN RELATION TO VECTOR OF EARTH'S GRAVITY**

V. I. Bogdanov, V. P. Krotov, and L. Ya. Kolemeyeva *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 6, Nov. - Dec. 1982 (JPRS-82654) 17 Jan. 1983 p 66-69 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 16, no. 6, Nov. - Dec. 1982 p 48-50 (For primary document see N83-18200 08-51)

Avail: NTIS HC A08/MF A01

A prolonged maintenance of rats with the long axis of the body positioned at +15 or -15 deg to the horizontal influenced their fluid-electrolyte metabolism. The experiments were carried out on 56 noninbred rats whose motor activity was diminished for 32 days. A close correlation between fluid-electrolyte metabolism and body position was established. As compared to the horizontal rats, the rats with the head at +15 deg showed decreases in body weight losses, diuresis, kali- and natriuresis; whereas the rats with the head at -15 deg exhibited increases of the parameters. M.G.

**N83-18212#** Joint Publications Research Service, Arlington, Va.
**EFFECT OF DRUGS ON DEVELOPMENT OF STRESS REACTION IN RATS EXPOSED TO ACOUSTIC STIMULUS**

V. N. Kostyuchenkov and V. S. Yasnetsov *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 6, Nov. - Dec. 1982 (JPRS-82654) 17 Jan. 1983 p 70-74 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 16, no. 6, Nov. - Dec. 1982 p 50-54 (For primary document see N83-18200 08-51)

Avail: NTIS HC A08/MF A01

The experiments were carried out on 349 white rats weighing 150 to 200 g that were exposed to the stress effect of 130 dB sound. Drugs were injected subcutaneously an hour before the animals were placed into a sound chamber. In this situation the following drugs proved to be the most effective sound protectors; barbamyl, seduxen, aminazin, galoperidol, chloroprotixen, apressin, phentolamine, inderal, and dopegyt. M.G.

**N83-18213#** Joint Publications Research Service, Arlington, Va.
**EVALUATION OF DEGREE OF GENETIC DETERMINATION OF HUMAN CARDIORESPIRATORY REACTIONS TO HYPOXIA AND HYPERCAPNIA** **c52**

T. V. Serebrovskaya *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 6, Nov. - Dec. 1982 (JPRS-82654) 17 Jan. 1983 p 75-81 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 16, no. 6, Nov. - Dec. 1982 p 54-58 (For primary document see N83-18200 08-51)

Avail: NTIS HC A08/MF A01

Using the twin method (16 pairs of monozygotic and 14 pairs of dizygotic twins), the role of the genotype and environment in the phenotypical variations of cardiorespiratory reactions to increasing hypoxia and hypercapnia was investigated. The process of emergency adaptation to acute hypoxia was shown to be associated with both genetically determined potentialities and acquired abilities. It is suggested that regular training may change sensitivity and emergency mechanisms of adaptation to hypoxia. However, the level of these changes depends on the individual genotype. The variability of hypercapnia sensitivity which is an individual genetically determined constant appears to be very low. M.G.

**N83-18214#** Joint Publications Research Service, Arlington, Va.
**DETERMINATION OF PSYCHOPHYSIOLOGICAL CRITERION FOR PREDICTING EFFECTIVENESS OF THE ADAPTATION PROCESS** **c53**

V. P. Leutin and Ye. I. Nikolayeva *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 6, Nov. - Dec. 1982 (JPRS-82654) 17 Jan. 1983 p 82-86 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 16, no. 6, Nov. - Dec. 1982 p 58-62 (For primary document see N83-18200 08-51)

Avail: NTIS HC A08/MF A01

A criterion for measuring the efficiency of adaptation to an altered environment is presented. The criterion is related to the quantitative evaluation of memory adequacy at early stages of the exposure to a new environment. An improvement in the reproduction of emotional words and a slight deterioration of the recollection of neutral words may be regarded as a prognostically significant criterion of the adaptation success. The lack of an improvement in the reproduction of emotionally important information and a significant deterioration of the recollection of neutral information at the early stages of adaptation is an adverse sign predicting a potential failure of the adaptation process. M.G.

**N83-18215#** Joint Publications Research Service, Arlington, Va.
**SEASONAL DYNAMICS OF CIRCADIAN RHYTHM OF HEMODYNAMICS AND ARTERIAL PRESSURE PARAMETERS IN PERMANENT RESIDENTS OF FOOTHILL AND HIGH-ALTITUDE REGIONS** **c52**

M. T. Turkmenov and T. K. Abdyldabekov *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 6, Nov. - Dec. 1982 (JPRS-82654) 17 Jan. 1983 p 87-93 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 16, no. 6, Nov. - Dec. 1982 p 62-66 (For primary document see N83-18200 08-51)

Avail: NTIS HC A08/MF A01

Diurnal and seasonal variations of hemodynamics parameters and blood pressure in high altitude residents (3200 m above sea level) were studied. The physiological functions showed a distinct rhythmicity. Amplitude phase characteristics of the physiological parameters were calculated according to the Kosinor program. Author

**N83-18216#** Joint Publications Research Service, Arlington, Va.
**STUDY OF EFFECT OF WEIGHTLESSNESS ON THE AQUATIC FERN, AZOLLA**

Ye. Ya. Shepelev, Nguyen Hyu Thyoc, V. A. Kordyum, G. I. Meleshko, T. B. Galkina, and V. G. Manko *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 6, Nov. - Dec. 1982 (JPRS-82654) 17 Jan. 1983 p 94-96 Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 16, no. 6, Nov. - Dec. 1982 p 66-68 (For primary document see N83-18200 08-51)

Avail: NTIS HC A08/MF A01

An exposure to six-day weightlessness of the fern Azolla pinna R. Br. symbiotically related to the nitrogen fixing alga Anabena azollae did not affect the main biological characteristics (growth, development, and morphological structure) of both fern plants and algae. The exposure did not influence the growth rate or subsequent Azolla generations on the Earth. Author

**N83-18217#** Joint Publications Research Service, Arlington, Va.
**NATURAL IMMUNITY FACTORS AS INDICATORS OF REACTIONS TO HELIOGEOPHYSICAL FACTORS c52**
L. A. Gushchina *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 6, Nov. - Dec. 1982 (JPRS-82654) 17 Jan. 1983 p 97-100 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 16, no. 6, Nov. - Dec. 1982 p 68-71 (For primary document see N83-18200 08-51)
Avail: NTIS HC A08/MF A01

The data treatment of immunological examinations of 2300 donors with the aid of the Distribution and Factor Analysis programs revealed a distinct relationship between natural immunity parameters and the heliophysical activity. The main heliophysical complex included solar flare intensity, radio frequency radiation and surface area of sunspots. Among the natural immunity parameters humoral factors of nonspecific protection showed the greatest variations. Author

**N83-18218#** Joint Publications Research Service, Arlington, Va.
**EFFECT OF LONG-TERM EXPOSURE TO HIGH-INTENSITY STEADY MAGNETIC FIELD ON ACTIVITY OF ADRENERGIC AND CHOLINERGIC SYSTEMS c52**
L. D. Klimovskaya and A. F. Maslova *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 6, Nov. - Dec. 1982 (JPRS-82654) 17 Jan. 1983 p 101-105 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 16, no. 6, Nov. - Dec. 1982 p 71-74 (For primary document see N83-18200 08-51)
Avail: NTIS HC A08/MF A01

The mice exposed for 1 month to a constant magnetic field of 1.6 T showed a significant increase in the epinephrine and norepinephrine concentration of blood. The acetylcholine content of blood grew on the 3d week of the exposure. The content of neurotransmitters in the brain tissue increased during the 3d week and returned to the normal by the end of the exposure. Author

**N83-18219#** Joint Publications Research Service, Arlington, Va.
**DYNAMICS OF HOUSE FLY LARVA GROWTH ON SOME FORMS OF ORGANIC WASTE IN A BIOLOGICAL LIFE-SUPPORT SYSTEM**
Ye. G. Golubeva and T. V. Yerofeyeva *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 6, Nov.-Dec. 1982 (JPRS-82654) 17 Jan. 1983 p 106-109 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 16, no. 6, Nov.-Dec. 1982 p 74-76 (For primary document see N83-18200 08-51)
Avail: NTIS HC A08/MF A01

The time course of the growth of Musca domestica larvae on organic wastes (human and Japanese quail excrements) was studied as a function of the egg density. An increase in the density of the substrate contamination reduced the weight of pupae and III instar larvae. The density effect in the case of quail excrements was seen earlier than in the case of human excrements. The larval weight on quail excrements was much lower than on human excrements, the density of substrate contamination being equal. On human excrements larvae grew more actively than on quail excrements, the magnitude of their relative increase was higher beginning with the 2d day of development. The density effect and the time course of the larval growth on the substrates used show that human excrements are a better nutrient medium for fly larvae. Author

**N83-18220#** Joint Publications Research Service, Arlington, Va.
**SHORT-TERM ACOUSTIC ADAPTATION AS A CRITERION OF RESISTANCE OF THE AUDITORY SYSTEM TO NOISE c52**
A. S. Rozenblyum *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 6, Nov. - Dec. 1982 (JPRS-82654) 17 Jan. 1983 p 110-114 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 16, no. 6, Nov. - Dec. 1982 p 76-79 (For primary document see N83-18200 08-51)
Avail: NTIS HC A08/MF A01

The typological features of short term acoustic adaptation (STAA) and its applicability for evaluating the hearing resistance to noise effects were investigated in those working in a noisy environment. The experiments were carried out on 29 subjects with normal hearing and 46 patients with neurosensory hypoacusis, including 25 patients with occupational hypoacusis. The STAA magnitude was evaluated as the difference between the hearing threshold of the 20 msec signal paired with a preceding adapting signal or without it. The duration of the adapting signal was in the range 20-1000 msec and its intensity was 40 dB over the hearing threshold. The signals were applied at 50 msec intervals. The STAA value was 5-25 dB in 90% normal subjects. In the patients with occupational hypoacusis, the hearing degradation increased as STAA declined. The patients with common neurosensory hypoacusis did not show such a relationship. It is recommended to use STAA as a measure of man's hearing resistance to noise effects. Author

**N83-18221#** Joint Publications Research Service, Arlington, Va.
**AMPLITUDE DISTORTIONS ON RHEOGRAMS WHEN RECORDED SIMULTANEOUSLY ON SEVERAL CHANNELS c52**
R. Kh. Tukshaitov and D. G. Maksimov *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 6, Nov. - Dec. 1982 (JPRS-82654) 17 Jan. 1983 p 115-118 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 16, no. 6, Nov. - Dec. 1982 p 80-82 (For primary document see N83-18200 08-51)
Avail: NTIS HC A08/MF A01

Rheography is one of the important methods for indirect evaluation of circulation and external respiration. This method is based on determination of electric resistance of the tested part of the human or animal body to high frequency electric current. In Soviet medicine and physiology, different types of rheographs are used for this purpose: bipolar, four channel, without frequency separation of channels (fRG-1A); bipolar, with frequency separation of channels (RG-4-01); and tetrapolar, two channel, with one generator for both channels (RPG-2-02). The instrumental margin or error is + or 5%; however, overall error factor could reach 10-20% and, in some cases, even more. One of the causes of such error factors could be the influence of rheographic leads on one another with multichannel recording. The conditions of appearance and magnitude of possible distortions of rheogram amplitudes when recorded simultaneously on two channels are defined. B.W.

**N83-18222#** Joint Publications Research Service, Arlington, Va.
**EFFECT OF SPACEFLIGHT ON LIPOGENESIS AND LIPOLYSIS IN RATS**
N. Skottova, L. Macho, M. Palkovic, and R. A. Tigranyan *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 6, Nov. - Dec. 1983 (JPRS-82654) 17 Jan. 1983 p 119-122 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 16, no. 6, Nov. - Dec. 1982 p 82-83 (For primary document see N83-18200 08-51)
Avail: NTIS HC A08/MF A01

When rats were flown for 22 days in space aboard Cosmos-605 biosatellite, they weighed less and there was a decrease in fatty tissue subcutaneously and in other fat reservoirs. Studies conducted aboard Cosmos-605, Cosmos-690 and Cosmos-782 revealed that prolonged exposure of rats to weightlessness was associated with some changes in lipid metabolism. The effect of spaceflight on activity of several enzymes involved in fat metabolism was investigated. Author

**N83-18223#** Joint Publications Research Service, Arlington, Va.
**HORMONE CONCENTRATION IN RAT BLOOD PLASMA AFTER FLIGHT ABOARD COSMOS-936 BIOSATELLITE**
R. A. Tigranyan, L. Macho, R. Kwetnansky, and N. F. Kalita *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 6, Nov. - Dec. 1982 (JPRS-82654) 17 Jan. 1983 p 123-127 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 16, no. 6, Nov. - Dec. 1982 p 84-87 (For primary document see N83-18200 08-51)
Avail: NTIS HC A08/MF A01

Investigations of vital physiological systems of animals, which

were conducted in experiments aboard biosatellites of the Cosmos series showed that it is possible for mammals (rats) to adapt to long term weightlessness. At the same time, these experiments revealed that there were several signs of activation of the endocrine system, namely, the hypothalamo-hypophysio-adrenocortical part, which appeared under the effect of the set of spaceflight factors and rapid change to Earth's gravity. Studies of blood plasma corticosterone concentration in rats after termination of experiments aboard Cosmos-605, Cosmos-690 and Cosmos-782 revealed that corticosterone level is elevated in the first few hours after the spaceflights. Then the plasma corticosterone level drops and is already considerably lower than the control level 24 h postflight. The spaceflight aboard Cosmos-782 did not cause any significant changes in the hormonal status of animals. Submitted here are the results obtained after the flight aboard Cosmos-936. B.W.

**N83-18224#** Joint Publications Research Service, Arlington, Va.
**EFFECT OF STEADY MAGNETIC FIELD ON HUMAN LYMPHOCYTES** **c52**
M. Mileva, B. Ivanov, M. Bulanova, and T. Pantev *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 6, Nov. - Dec. 1982 (JPRS-82654) 17 Jan. 1983 p 128-130 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 16, no. 6, Nov. - Dec. 1982 p 86-87 (For primary document see N83-18200 08-51)
Avail: NTIS HC A08/MF A01

Exposure to steady magnetic field (SMF) for different periods of time did not elicit statistically reliable increase in chromosome aberrations in human peripheral blood lymphocytes. Metaphase analysis of Crepis capilaris cells revealed that SMF (9 k0e, 200 0e/cm) for 2 days did not induce chromosome aberrations. Nor were any changes demonstrated in roots of beans, onions and L-fibroblasts of subcutaneous tissue of mice and Chinese hamsters. The obtained data are indicative of absence of cytogenetic effect of SMF. The level and spectrum of chromosome aberrations did not exceed the values for spontaneous chromatic fragments in cultures. Cytogenetic analysis of DEDE cells of the Chinese hamster revealed a mild mutagenic effect of SMF. Chromosomal aberrations were also demonstrated after exposure (5 min) of garlic roots. B.W.

**N83-18225#** Joint Publications Research Service, Arlington, Va.
**CHANGES IN SOME BIOCHEMICAL PARAMETERS OF BLOOD AS A FUNCTION OF PROGRAM OF ACCELERATIONS** **c54**
J. Domaczuk *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 6, Nov. - Dec. 1982 (JPRS-82654) 17 Jan. 1983 p 131-134 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 16, no. 6, Nov. - Dec. 1982 p 87-89 (For primary document see N83-18200 08-51)
Avail: NTIS HC A08/MF A01

Resistance to accelerations can be characterized by both the maximum acceleration achieved and duration of exposure to a specified level of accelerations. As a rule, resistance to accelerations is evaluated with the use of centrifuges. As we know, accelerations elicit hemodynamic disorders, which result in hypoxia. Under such conditions, there is also impairment of biochemical processes. The objective there was to examine the end metabolic products in animals, in whom accelerations elicited bradycardia upon reaching maximum endurance, due to both duration of exposure (time program) and magnitude of accelerations (linear program). B.W.

**N83-18226#** Joint Publications Research Service, Arlington, Va.
**USSR REPORT: LIFE SCIENCES. BIOMEDICAL AND BEHAVIORAL SCIENCES, NO. 26**
28 Dec. 1982 70 p refs Transl. into ENGLISH from various Russian articles
(JPRS-82544) Avail: NTIS HC A04/MF A01

Psychophysiological pilot training, pilot psychology in civil aviation, and raising body resistance to effects of environmental chemical pollutant are discussed. For individual titles, see N83-18227 through N83-18229.

**N83-18227#** Joint Publications Research Service, Arlington, Va.
**PSYCHOPHYSIOLOGICAL PILOT TRAINING** **c53**
A. Korolev *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci., No. 26 (JPRS-82544) 28 Dec. 1982 p 1-4 Transl. into ENGLISH from Vozdushnyy Transport (Moscow), 14 Sep. 1982 p 3 (For primary document see N83-18226 08-51)
Avail: NTIS HC A04/MF A01

Pilot training methods are discussed. N.W.

**N83-18228#** Joint Publications Research Service, Arlington, Va.
**NEW EMPHASIS ON PILOT PSYCHOLOGY IN CIVIL AVIATION** **c53**
L. Tsesarkin *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci., No. 26 (JPRS-82544) 28 Dec. 1982 p 5-7 Transl. into ENGLISH from Vozdushnyy Transport (Moscow), 5 Oct. 1982 p 3 (For primary document see N83-18226 08-51)
Avail: NTIS HC A04/MF A01

Discipline and a lack of self-control, a sense of responsibility for obligations and irresponsibility, a firm word and a lack of reliability. What elicits these or other human actions, what is their cause? How does the psychological climate in a group influence work results? Answers are discussed. Author

**N83-18229#** Joint Publications Research Service, Arlington, Va.
**PROBLEM OF RAISING BODY'S RESISTANCE TO EFFECT OF ENVIRONMENTAL CHEMICAL POLLUTANTS** **c52**
Yu. I. Prokopenko *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci., No. 26 (JPRS-82544) 28 Dec. 1982 p 27-32 refs Transl. into ENGLISH from Gigiyena i Sanit. (Moscow), no. 12, Dec. 1981 p 8-10 (For primary document see N83-18226 08-51)
Avail: NTIS HC A04/MF A01

Raising the activity of defensive-adaptive mechanisms in relaion to the action of chemical compounds contained in the environment is addressed. Author

## 52 AEROSPACE MEDICINE

Includes physiological factors, biological effects of radiation; and weightlessness.

**N83-18230*** National Aeronautics and Space Administration, Washington, D. C.
**AEROSPACE MEDICINE AND BIOLOGY. A CONTINUING BIBLIOGRAPHY WITH INDEXES, SUPPLEMENT 240, JANUARY 1983**
Jan. 1983 113 p
(NASA-SP-7011(240); NAS 1.21:7011(240)) Avail: NTIS HC $7.00 CSCL 06E

Reports, articles and other documents, numbering 357, introduced into the NASA scientific and technical information system in December 1982 are given. R.J.F.

**N83-18231#** Los Alamos Scientific Lab., N. Mex.
**NERVE-PULSE INTERACTIONS**
Alwyn C. Scott 1982 24 p refs Presented at the US/Japan Seminar on Competition and Cooperation in Neural Nets, Kyoto, 15-19 Feb. 1982
(Contract W-7405-eng-36)
(DE82-006133; LA-UR-81-3728; CONF-820209-1) Avail: NTIS HC A02/MF A01

Some recent experimental and theoretical results on mechanisms through which individual nerve pulses can interact are reviewed. Three modes of interactions are considered: (1) interaction of pulses as they travel along a single fiber which leads to velocity dispersion; (2) propagation of pairs of pulses through a branching region leading to quantum pulse code transformations; and (3) interaction of pulses on parallel fibers through which they may form a pulse assembly. This notion is analogous to Hebb's concept of a cell assembly, but on a lower level of the neural hierarchy. DOE

**N83-18232#** Los Alamos Scientific Lab., N. Mex.
**INDUCIBLE PROTECTIVE PROTEINS: A POTENTIALLY NOVEL APPROACH TO CHEMOTHERAPY**
R. A. Tobey, M. D. Enger, J. K. Griffith, and C. E. Hildebrand 1982 32 p refs Presented at the Conf. on Cell Proliferation, Cancer and Cancer Therapy, New York, 17-19 Feb. 1982
(Contract W-7405-eng-36)
(DE82-008116; LA-UR-82-382; CONF-820231-1) Avail: NTIS HC A03/MF A01

A variety of trace elements (Zn, Se, Cu, As) were utilized as inducers of synthesis of protective species in line CHO Chinese hamster cells and in a number of derived variants to determine if this approach can be utilized to increase resistance to alkylating agent toxicity. It is indicated that Zn, Se, and Cu elicit a protective response against the toxic effects of iodoacetate or melphalan, and, at least in the case of zinc, at levels which are physiologically reasonable. Arsenite appears to be a marginally effective inducer in the CHO cell. The protective responses induced by zinc or selenite alone are additive in cells receiving both trace element prior to exposure to alkylating agent. It is suggested that different domains of response are elicited by the two metals. Differences in inducibility of protective proteins between normal and tumor cells, the possibility for a novel approach to alkylating agent chemotherapy, is somewhat analogous to the protocol utilized in high dose methotrexate therapy. DOE

**N83-18233#** Oak Ridge National Lab., Tenn. Biology Div.
**SPECIES HETEROGENEITY IN THE METABOLIC PROCESSING OF BENZO(A)PYRENE**
James K. Selkirk, Michael C. MacLeod, Betty K. Mansfield, P. A. Nikbakht, and Kris C. Dearstone 1981 21 p refs Presented at the Symp. on Organ and Species Specificity in Chem. Carcinogenesis, Raleigh, N.C., 2 Mar. 1981 Sponsored in part by the National Cancer Inst.
(Contract W-7405-eng-26)
(DE82-008843; CONF-8103119-1) Avail: NTIS HC A02/MF A01

The drug metabolizing microsomal mixed-function oxidase is a complex of enzymes required for the activation and detoxification of xenobiotics. Metabolism studies with many chemical carcinogens and mutagens showed a remarkable qualitative similarity in the metabolic products formed by this enzyme complex. However, there is considerable variance from a quantitative aspect at several important levels. Variable levels of mixed function oxidase and the detoxification epoxide hydrase may be found within a given activation system. This in turn may dictate whether there will be a high or low relative level of reactive electrophile available for interaction with critical target sites. Beno(a)pyrene, a major environmental carcinogen and mutagen, was used as the paradigm for environmental chemical carcinogens. The metabolism of B(a)P in human and rodent cell lines was studied to determine quantitative and qualitative variance between species. DOE

**N83-18234#** Wisconsin Univ., Madison. Dept. of Medical Physics.
**SEMI-PHENOMENOLOGICAL METHOD FOR APPLYING MICRODOSIMETRY IN ESTIMATING BIOLOGICAL RESPONSE**
P. D. Higgins, P. M. DeLuca, Jr., D. W. Pearson, and M. N. Gould 1981 18 p refs
(Contract DE-AS02-76EV-01105; Grants NIH-1T32-CA-09206-01(PDH); NCI-P30-CA-19298; NCI-P01-CA-19298)
(DE82-009367; DOE/EV-01105/283) Avail: NTIS HC A02/MF A01

A semi-phenomenological approach was used to estimate cell survival on the basis of microdosimetrically obtained measurements of beam quality, together with determinations of the biological cytotoxic response parameters of V79 Chinese hamster cells. Cells were exposed of a field of minimally ionizing radiation and to fields at least partially comprised of high LET radiation. It was shown that for widely varying experimental conditions cell survival can be predicted with good reliability for any arbitrary known beam quality and with a minimum of biological input. DOE

**N83-18235#** Wisconsin Univ., Madison. Dept. of Medical Physics.
**FAST-NEUTRON AND PHOTON DOSES DETERMINED WITH PROPORTIONAL COUNTERS AND IONIZATION CHAMBERS**
P. M. DeLuca, Jr., P. D. Higgins, M. C. Schell, and D. W. Pearson 1981 15 p refs
(Contract DE-AS02-76EV-01105; Grant NIH-5T32-CA-09206-01) (DE82-009369; DOE/EV-01105/285) Avail: NTIS HC A02/MF A01

The application of paired miniature proportional counters to n/gamma dose separation is reported. A 60Co teletherapy source was coupled to an existing source of fast neutrons. These sources may be operated to provide precise and controlled mixtures of photons and neutrons. Graphic and A150 plastic walled proportional counters were employed. Results are compared to dose values deduced from a conventional A150 plastic ionization chamber and a neutron insensitive GM counter. DOE

**N83-18236#** Wisconsin Univ., Madison. Dept. of Medical Physics.
**APPLICATION OF A150-PLASTIC EQUIVALENT GASES IN MICRODOSIMETRIC MEASUREMENTS**
P. M. DeLuca, Jr., P. D. Higgins, D. W. Pearson, M. C. Schell, and F. H. Attix 1981 23 p refs
(Contract DE-AS02-76EV-01105; Grants NIH-1T32-CA-09206-01(PHD); NCI-P30-CA-19298; NCI-P01-CA-19298)
(DE82-009368; DOE/EV-01105/284) Avail: NTIS HC A02/MF A01

Neutron dosimetry measurements with ionization chambers which for the most part, employ tissue equivalent plastic walled cavities filled with either air or a methane base tissue like gas are discussed. The atomic composition of TE gas and A150 plastic are not matched and are quite dissimilar from muscle. A novel A150 plastic equivalent gas was formulated. This establishes a homogeneous wall gas cavity dosimeter for neutron measurements and confines the necessary corrections to the applications of kerma ratios. Measurements of applications of two A150 plastic equivalent gases in a low pressure spherical proportional counter are presented. Gas gains and alpha particle resolutions were determined. Measurements of event size distributions from exposure to a beam of 14.8 MeV neutrons are reported for the A150 mixtures and a methane based TE-gas and an Ar-CO2 mixture. DOE

**N83-17494#** Canadian Forces Air Command, Winnipeg (Manitoba).
**A BRIEF REVIEW OF SELECTED AREAS OF AVIATION MEDICINE AND PHYSIOLOGY**
W. C. Hartzell *In* AGARD Human Factors Aspects of Aircraft Accidents Oct. 1982 21 p refs (For primary document see N83-17490 08-01)
Avail: NTIS HC A07/MF A01

**N83-17496#** Edinburgh Univ. (Scotland). Dept. of Forensic Medicine.
**PATHOLOGY ASPECTS OF THE HUMAN FACTORS INVESTIGATION**
J. K. Mason *In* AGARD Human Factors Aspects of Aircraft Accidents Oct. 1982 5 p refs (For primary document see N83-17490 08-01)
Avail: NTIS HC A07/MF A01

**N83-17499#** Air Force Hospital, England AFB, La.
**AIRCRAFT ACCIDENT INVESTIGATION AND THE FLIGHT SURGEON**
Russell B. Rayman *In* AGARD Human Factors Aspects of Aircraft Accidents Oct. 1982 8 p refs (For primary document see N83-17490 08-01)
Avail: NTIS HC A07/MF A01

**N83-17500#** Edinburgh Univ. (Scotland). Dept. of Forensic Medicine.
**MEDICO LEGAL ASPECTS OF THE PATHOLOGICAL INVESTIGATION**

J. K. Mason *In* AGARD Human Factors Aspects of Aircraft Accidents Oct. 1982 5 p refs (For primary document see N83-17490 08-01)
Avail: NTIS HC A07/MF A01

**N83-18193#** Army Intelligence and Threat Analysis Center, Arlington, Va.
**THERAPEUTIC-PROPHYLATIC MEASURES IN DISEASES OF THE ORGAN OF VISION AMONG FLYING PESONNEL**
L. M. Asyyev *In its* Mil. Med. J., No. 8, August 1982 Aug. 1982 p 61-64 refs Transl. into ENGLISH from Voyenno-Med. Zh. (Moscow), no. 8, 1982 p 41-42 (For primary document see N83-18191 08-51)
Avail: NTIS HC A07/MF A01

**N83-18201#** Joint Publications Research Service, Arlington, Va.
**SPACE MEDICINE BENEFITS TO SCIENCE AND HEALTH CARE**
B. S. Alyakrinskiy *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 6, Nov. - Dec. 1982 (JPRS-82654) 17 Jan. 1983 p 1-4 Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 16, no. 6, Nov. - Dec. 1982 p 4-6 (For primary document see N83-18200 08-51)
Avail: NTIS HC A08/MF A01

**N83-18203#** Joint Publications Research Service, Arlington, Va.
**PHYSIOLOGICAL AND HYGIENIC ASPECTS OF IMPLEMENTATION OF COSMONAUTS WORK IN ORBITAL FLIGHT**
I. P. Abramov, A. S. Barer, M. I. Vakar, L. G. Golovkin, V. P. Zinchenko, S. N. Filipenkov, R. Kh. Sharipov, and V. V. Shchigolev *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 6, Nov. - Dec. 1982 (JPRS-82654) 17 Jan. 1983 p 18-25 Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 16, no. 6, Nov. - Dec. 1982 p 16-22 (For primary document see N83-18200 08-51)
Avail: NTIS HC A08/MF A01

**N83-18204#** Joint Publications Research Service, Arlington, Va.
**CHANGES IN VOLUME OF PLASMA, EXTRACELLULAR FLUID AND PLASMA PROTEIN MASS DURING ANTIORTHOSTATIC HYPOKINESIA AND IMMERSION**
A. M. Chayka and I. S. Balakhovskiy *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 6, Nov. - Dec. 1982 (JPRS-82654) 17 Jan. 1983 p 26-34 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 16, no. 6, Nov. - Dec. 1982 p 22-28 (For primary document see N83-18200 08-51)
Avail: NTIS HC A08/MF A01

**N83-18205#** Joint Publications Research Service, Arlington, Va.
**EFFECT OF SYDNOCARB ON CARDIORESPIRATORY SYSTEM DURING SEVEN-DAY WATER IMMERSION AND EXERCISE**
O. D. Anashkin and S. M. Belyayev *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 6, Nov.-Dec. 1982 (JPRS-82654) 17 Jan. 1983 p 35-40 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 16, no. 6, Nov. - Dec. 1982 p 35-40 (For primary document see N83-18200 08-51)
Avail: NTIS HC A08/MF A01

**N83-18206#** Joint Publications Research Service, Arlington, Va.
**HUMAN EQUILIBRIUM DURING ROTATION AT DIFFERENT LEVELS OF HYPERGRAVITY**
A. R. Kotovskaya, L. N. Gavrilova, R. R. Galle, F. Glavacka, M. Schalling, and P. Duda *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 6, Nov. - Dec. 1982 (JPRS-82654) 17 Jan. 1983 p 41-44 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 16, no. 6, Nov. - Dec. 1982 p 32-34 (For primary document see N83-18200 08-51)
Avail: NTIS HC A08/MF A01

**N83-18213#** Joint Publications Research Service, Arlington, Va.
**EVALUATION OF DEGREE OF GENETIC DETERMINATION OF HUMAN CARDIORESPIRATORY REACTIONS TO HYPOXIA AND HYPERCAPNIA**
T. V. Serebrovskaya *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 6, Nov. - Dec. 1982 (JPRS-82654) 17 Jan. 1983 p 75-81 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 16, no. 6, Nov. - Dec. 1982 p 54-58 (For primary document see N83-18200 08-51)
Avail: NTIS HC A08/MF A01

**N83-18215#** Joint Publications Research Service, Arlington, Va.
**SEASONAL DYNAMICS OF CIRCADIAN RHYTHM OF HEMODYNAMICS AND ARTERIAL PRESSURE PARAMETERS IN PERMANENT RESIDENTS OF FOOTHILL AND HIGH-ALTITUDE REGIONS**
M. T. Turkmenov and T. K. Abdyldabekov *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 6, Nov. - Dec. 1982 (JPRS-82654) 17 Jan. 1983 p 87-93 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 16, no. 6, Nov. -.Dec. 1982 p 62-66 (For primary document see N83-18200 08-51)
Avail: NTIS HC A08/MF A01

**N83-18217#** Joint Publications Research Service, Arlington, Va.
**NATURAL IMMUNITY FACTORS AS INDICATORS OF REACTIONS TO HELIOGEOPHYSICAL FACTORS**
L. A. Gushchina *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 6, Nov. - Dec. 1982 (JPRS-82654) 17 Jan. 1983 p 97-100 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 16, no. 6, Nov. - Dec. 1982 p 68-71 (For primary document see N83-18200 08-51)
Avail: NTIS HC A08/MF A01

**N83-18218#** Joint Publications Research Service, Arlington, Va.
**EFFECT OF LONG-TERM EXPOSURE TO HIGH-INTENSITY STEADY MAGNETIC FIELD ON ACTIVITY OF ADRENERGIC AND CHOLINERGIC SYSTEMS**
L. D. Klimovskaya and A. F. Maslova *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 6, Nov. - Dec. 1982 (JPRS-82654) 17 Jan. 1983 p 101-105 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 16, no. 6, Nov. - Dec. 1982 p 71-74 (For primary document see N83-18200 08-51)
Avail: NTIS HC A08/MF A01

**N83-18220#** Joint Publications Research Service, Arlington, Va.
**SHORT-TERM ACOUSTIC ADAPTATION AS A CRITERION OF RESISTANCE OF THE AUDITORY SYSTEM TO NOISE**
A. S. Rozenblyum *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 6, Nov. - Dec. 1982 (JPRS-82654) 17 Jan. 1983 p 110-114 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 16, no. 6, Nov. - Dec. 1982 p 76-79 (For primary document see N83-18200 08-51)
Avail: NTIS HC A08/MF A01

**N83-18221#** Joint Publications Research Service, Arlington, Va.
**AMPLITUDE DISTORTIONS ON RHEOGRAMS WHEN RECORDED SIMULTANEOUSLY ON SEVERAL CHANNELS**
R. Kh. Tukshaitov and D. G. Maksimov *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 6, Nov. - Dec. 1982 (JPRS-82654) 17 Jan. 1983 p 115-118 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 16, no. 6, Nov. - Dec. 1982 p 80-82 (For primary document see N83-18200 08-51)
Avail: NTIS HC A08/MF A01

**N83-18224#** Joint Publications Research Service, Arlington, Va.
**EFFECT OF STEADY MAGNETIC FIELD ON HUMAN LYMPHOCYTES**
M. Mileva, B. Ivanov, M. Bulanova, and T. Pantev *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 6, Nov. - Dec. 1982 (JPRS-82654) 17 Jan. 1983 p 128-130 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 16, no. 6, Nov. - Dec. 1982 p 86-87 (For primary document

see N83-18200 08-51)
Avail: NTIS HC A08/MF A01

**N83-18229#** Joint Publications Research Service, Arlington, Va.
**PROBLEM OF RAISING BODY'S RESISTANCE TO EFFECT OF ENVIRONMENTAL CHEMICAL POLLUTANTS**
Yu. I. Prokopenko *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci., No. 26 (JPRS-82544) 28 Dec. 1982 p 27-32 refs Transl. into ENGLISH from Gigiyena i Sanit. (Moscow), no. 12, Dec. 1981 p 8-10 (For primary document see N83-18226 08-51)
Avail: NTIS HC A04/MF A01

# 53 BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

**N83-18237#** National Aerospace Lab., Amsterdam (Netherlands). Flight Div.
**NLR RESEARCH ON PILOT DYNAMICS AND WORKLOAD**
R. C. vandeGraaff 11 Jan. 1982 17 p refs Presented at AIAA/AFFTC/NASA Dryden Workshop on Flight Testing to Identify Pilot Workload and Pilot Dyn., Edwards AFB, Calif., Jan. 1982
(NLR-MP-82002-U) Avail: NTIS HC A02/MF A07

Pilot performance and workload both in manual and monitoring tasks were studied. Human control behavior, task condition and control effort in terms of modern control theory, as well as the assessment of pilot workload by physiological parameters are described. It is indicated that the optimal control model structure provides a meaningful representation of pilot workload and dynamics in complex control tasks. The results of an in flight helicopter experiment reflect a good correlation between model results, performance and workload measures, measured system performance quantities, subjective effort ratings, and measures of heart rate and respiration. It is found that skin resistance measures are sensitive to uncertainty aspects of the task rather than to the performance aspects. E.A.K.

**N83-18192#** Army Intelligence and Threat Analysis Center, Arlington, Va.
**MEANS FOR INCREASING THE WORKING CAPACITY OF PERSONS SUBJECT TO EXTENDED SENSORY OVERLOADS**
G. I. Alekseyev, D. V. Gusarov, and Yu. A. Sobolin *In its* Mil. Med. J., No. 8, August 1982 Aug. 1982 56-60 refs Transl. into ENGLISH from Voyenno-Med. Zh. (Moscow), no. 8, 1982 p 38-40 (For primary document see N83-18191 08-51)
Avail: NTIS HC A07/MF A01

**N83-18214#** Joint Publications Research Service, Arlington, Va.
**DETERMINATION OF PSYCHOPHYSIOLOGICAL CRITERION FOR PREDICTING EFFECTIVENESS OF THE ADAPTATION PROCESS**
V. P. Leutin and Ye. I. Nikolayeva *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 6, Nov. - Dec. 1982 (JPRS-82654) 17 Jan. 1983 p 82-86 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 16, no. 6, Nov. - Dec. 1982 p 58-62 (For primary document see N83-18200 08-51)
Avail: NTIS HC A08/MF A01

**N83-18227#** Joint Publications Research Service, Arlington, Va.
**PSYCHOPHYSIOLOGICAL PILOT TRAINING**
A. Korolev *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci., No. 26 (JPRS-82544) 28 Dec. 1982 p 1-4 Transl. into ENGLISH from Vozdushnyy Transport (Moscow), 14 Sep. 1982 p 3 (For primary document see N83-18226 08-51)
Avail: NTIS HC A04/MF A01

**N83-18228#** Joint Publications Research Service, Arlington, Va.
**NEW EMPHASIS ON PILOT PSYCHOLOGY IN CIVIL AVIATION**
L. Tsesarkin *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci., No. 26 (JPRS-82544) 28 Dec. 1982 p 5-7 Transl. into ENGLISH from Vozdushnyy Transport (Moscow), 5 Oct. 1982 p 3 (For primary document see N83-18226 08-51)
Avail: NTIS HC A04/MF A01

# 54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

**N83-18238*#** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
**HUMAN FACTORS CONSIDERATIONS IN SYSTEM DESIGN**
Christine M. Mitchell, ed. (George Mason Univ.), Paula M. VanBalen, ed. (George Mason Univ.), and Karen L. Moe, ed. Jan. 1983 381 p refs Symp. held in Greenbelt, Md. and College Park, Md., 25-26 May 1982
(Contract NAS5-26952)
(NASA-CP-2246; NAS 1.55:2246) Avail: NTIS HC A17/MF A01 CSCL 05H

Human factors considerations in systems design was examined. Human factors in automated command and control, in the efficiency of the human computer interface and system effectiveness are outlined. The following topics are discussed: human factors aspects of control room design; design of interactive systems; human computer dialogue, interaction tasks and techniques; guidelines on ergonomic aspects of control rooms and highly automated environments; system engineering for control by humans; conceptual models of information processing; information display and interaction in real time environments. For individual titles, see N83-18239 through N83-18250.

**N83-18239*#** Johns Hopkins Univ., Baltimore, Md. Dept. of Psychology.
**INTRODUCTION TO HUMAN FACTORS CONSIDERATIONS IN SYSTEM DESIGN**
Alphonse Chapanis *In* NASA. Goddard Space Flight Center Human Factors Considerations in System Design Jan. 1983 p 11-24 ref (For primary document see N83-18238 08-54)
Avail: NTIS HC A17/MF A01 CSCL 05H

A definition for human factors or ergonomics and its industrial and domestic application is presented. Human factors engineering, which discovers and applies information about human abilities, limitations, and other characteristics to the design of tools, machines, systems, tasks, jobs, and environments for safe, comfortable, and effective human use, is outlined. The origins of human factors and ergonomics, the philosophy of human factors, goals and objectives, systems development and design, are reviewed. E.A.K.

**N83-18240*#** Nuclear Regulatory Commission, Washington, D.C. Human Factors Branch.
**HUMAN FACTORS ASPECTS OF CONTROL ROOM DESIGN**
James P. Jenkins *In* NASA. Goddard Space Flight Center Human Factors Considerations in System Design Jan. 1983 p 27-46 refs (For primary document see N83-18238 08-54)
Avail: NTIS HC A17/MF A01 CSCL 05H

A plan for the design and analysis of a multistation control room is reviewed. It is found that acceptance of the computer based information system by the uses in the control room is mandatory for mission and system success. Criteria to improve computer/user interface include: match of system input/output with user; reliability, compatibility and maintainability; easy to learn and little training needed; self descriptive system; system under user control; transparent language, format and organization; corresponds to user expectations; adaptable to user experience level; fault tolerant; dialog capability user communications needs reflected in flexibility, complexity, power and information load; integrated system; and documentation. E.A.K.

**N83-18241*#** George Washington Univ., Washington, D.C. Dept. of Electrical Engineering and Computer Science.
**HUMAN-COMPUTER DIALOGUE: INTERACTION TASKS AND TECHNIQUES. SURVEY AND CATEGORIZATION**
James D. Foley *In* NASA. Goddard Space Flight Center Human Factors Considerations in System Design Jan. 1983 p 91-106 refs (For primary document see N83-18238 08-54)
Avail: NTIS HC A17/MF A01 CSCL 05H

Interaction techniques are described. Six basic interaction tasks, requirements for each task, requirements related to interaction techniques, and a technique's hardware prerequisites affective device selection are discussed. E.A.K.

**N83-18242*#** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
**PRELIMINARY REPORT OF GODDARD/UNIVERSITY HUMAN FACTORS RESEARCH GROUP**
Walter Truszkowski *In its* Human Factors Considerations in System Design Jan. 1983 p 109-126 refs (For primary document see N83-18238 08-54)
Avail: NTIS HC A17/MF A01 CSCL 05H

The three major concerns which greatly influence the initial efforts and priorities in the human factors arena are outlined. These concerns are an increased awareness of the: (1) over riding data driven aspects of current command/control systems; (2) complexity of existing man/system interface mechanisms; and (3) great extent of the manual intervention required in present systems. E.A.K.

**N83-18243*#** George Mason Univ., Fairfax, Va.
**GUIDELINES ON ERGONOMIC ASPECTS OF CONTROL ROOMS**
Christine M. Mitchell, Alexander K. Bocast, and Lisa J. Stewart *In* NASA. Goddard Space Flight Center Human Factors Considerations in System Design Jan. 1983 p 129-202 refs (For primary document see N83-18238 08-54)
Avail: NTIS HC A17/MF A01 CSCL 05H

The anthropometry, workstation design, and environmental design of control rooms are outlined. The automated interface and VDTs and displays and various modes of communication between the system and the human operator using VDTs are discussed. The man in the loop is examined, the single controller single task framework and multiple controller multiple tasks issues are considered. E.A.K.

**N83-18244*#** Computer Technology Associates, Arlington, Va. Space Systems Analysis.
**A CASE STUDY OF A SYSTEM ENGINEERED FOR CONTROL BY HUMANS**
Joseph Rothenberg *In* NASA. Goddard Space Flight Center Human Factors Considerations in System Design Jan. 1983 p 205-214 (For primary document see N83-18238 08-54)
Avail: NTIS HC A17/MF A01 CSCL 05H

Alternatives to the traditional concepts for real time health and safety operations were examined. The pitfalls of the conventional contingency planning for health and safety are highlighted. The Solar Maximum Mission (SMM) contingency planning and operations provides the evolution from the conventional people intensive health and safety operation, toward a night watchman mode of operations. The SMM spacecraft health and safety operations were budget constrained to the point that one operator was responsible for the health and safety of the entire spacecraft one week after launch. The spacecraft was a protoflight with brand new subsystem configurations, software and procedures. To manage the risks associated with this one man SMM health and safety operation, the real time contingency planning and operations centered around unambiguously identifying a system level problem, and reactively safing components susceptible to unrecoverable damage. The methodology applied to both analyzing and implementing this approach of SMM is shown. E.A.K.

**N83-18245*#** George Mason Univ., Fairfax, Va. Dept. of Psychology.
**CONCEPTUAL MODELS OF INFORMATION PROCESSING**
Lisa J. Stewart *In* NASA. Goddard Space Flight Center Human Factors Considerations in System Design Jan. 1983 p 217-238 refs (For primary document see N83-18238 08-54)
Avail: NTIS HC A17/MF A01 CSCL 05H

The conceptual information processing issues are examined. Human information processing is defined as an active cognitive process that is analogous to a system. It is the flow and transformation of information within a human. The human is viewed as an active information seeker who is constantly receiving, processing, and acting upon the surrounding environmental stimuli. Human information processing models are conceptual representations of cognitive behaviors. Models of information processing are useful in representing the different theoretical positions and in attempting to define the limits and capabilities of human memory. It is concluded that an understanding of conceptual human information processing models and their appliications to systems design leads to a better human factors approach. E.A.K.

**N83-18246*#** George Washington Univ., Washington, D.C. Dept. of Electrical Engineering and Computer Science.
**TOP-DOWN METHODOLOGY FOR HUMAN FACTORS RESEARCH**
John Sibert *In* NASA. Goddard Space Flight Center Human Factors Considerations in System Design Jan. 1983 p 241-255 refs (For primary document see N83-18238 08-54)
Avail: NTIS HC A17/MF A01 CSCL 05H

User computer interaction as a conversation is discussed. The design of user interfaces which depends on viewing communications between a user and the computer as a conversion is presented. This conversation includes inputs to the computer (outputs from the user), outputs from the computer (inputs to the user), and the sequencing in both time and space of those outputs and inputs. The conversation is viewed from the user's side of the conversation. Two languages are modeled: the one with which the user communicates with the computer and the language where communication flows from the computer to the user. Both languages exist on three levels; the semantic, syntactic and lexical. It is suggested that natural languages can also be considered in these terms. E.A.K.

**N83-18247*#** George Mason Univ., Fairfax, Va. Decision Sciences Faculty.
**THE HUMAN AS SUPERVISOR IN AUTOMATED SYSTEMS**
Christine M. Mitchell *In* NASA. Goddard Space Flight Center Human Factors Considerations in System Design Jan. 1983 p 259-290 refs (For primary document see N83-18238 08-54)
Avail: NTIS HC A17/MF A01 CSCL 05H

This hierarchical approach to information display forces the development of a set of human oriented system models which will guide the design of the displays. If the appropriate information is provided at the appropriate time, it is likely that less information will be displayed at any given time, and the quality of the displayed information will require less operator effort to integrate into an assimilatable form. A problem with contemporary control rooms is that there is too much information for an operator to be able to assimilate quickly, easily, and accurately. It is suggested that necessary direction for research in the area of automated control room design is to develop displays which provide active decision aiding for the modern controller. Displays are needed which provide information compatible with the operator's current internal model, filter out irrelevant information, and summarize and condense lower level information. E.A.K.

**N83-18248*#** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
**ERBS HUMAN FACTORS ANALYSIS: A CASE STUDY**
Karen L. Moe and Charles Weger (Computer Sciences Corp.) *In its* Human Factors Considerations in System Design Jan. 1983 p 293-300 (For primary document see N83-18238 08-54)
Avail: NTIS HC A17/MF A01 CSCL 05H

The incorporation of human factors into the system development process and the benefits derived are discussed. The human factors analysis task for the Earth radiation budget satellite (ERBS)

payload operations control center (POCC) is a pathfinder in the new applications approach to this discipline within the mission and data operations directorate. The topics covered include: discussions of the motivation for human factors analysis; the involvement of the human factors research group (HFRG) with project and system developers, and some examples of human factors issues addressed in the ERBS analysis task. E.A.K.

**N83-18249*#** George Washington Univ., Washington, D.C. Dept. of Psychology.
**MECHANICS OF CONDUCTING A TASK ANALYSIS**
Virginia Rappold *In* NASA. Goddard Space Flight Center Human Factors Considerations in System Design Jan. 1983 p 303-318 refs (For primary document see N83-18238 08-54)
Avail: NTIS HC A17/MF A01 CSCL 05H

Task analysis (TA) which is a set of analytical procedures used to describe human work in terms of tasks is discussed. The method of TA was derived from various techniques of methods analysis of the industrial engineers. The topic of TA is organized around the following main areas: (1) a detailed discussion of what a TA is; (2) the uses of TA; (3) evaluation of the TA procedure and an assessment of the procedure's worth. E.A.K.

**N83-18250*#** George Mason Univ., Fairfax, Va. Decision Sciences Faculty.
**INFORMATION DISPLAY AND INTERACTION IN REAL-TIME ENVIRONMENTS**
Alexander K. Bocast *In* NASA. Goddard Space Flight Center Human Factors Considerations in System Design Jan. 1983 p 321-358 refs (For primary document see N83-18238 08-54)
Avail: NTIS HC A17/MF A01 CSCL 05H

The available information bandwidth as a funcion of system's complexity and time constraints in a real time control environment were examined. Modern interactive graphics techniques provide very high bandwidth data displays. In real time control environments, effective information interaction rates are a function not only of machine data technologies but of human information processing capabilities and the four dimensional resolution of available interaction techniques. The available information bandwidth as a function of system's complexity and time constraints in a real time control environment were examined. E.A.K.

**N83-18251*#** Essex Corp., Huntsville, Ala.
**HUMAN OPERATOR PERFORMANCE OF REMOTELY CONTROLLED TASKS: TELEOPERATOR RESEARCH CONDUCTED AT NASA'S GEORGE C. MARSHAL SPACE FLIGHT CENTER Summary Report, 1971 - 1981**
Nicholas Shields, Jr., Frances Piccione, Mark Kirkpatrick, III, and Thomas B. Malone Mar. 1982 96 p refs
(Contract NAS8-31848)
(NASA-CR-170716; NAS 1.26:170716; H-82-01) Avail: NTIS HC A05/MF A01 CSCL 05H

The capabilities within the teleoperator laboratories to perform remote and teleoperated investigations for a wide variety of applications are described. Three major teleoperator issues are addressed: the human operator, the remote control and effecting subsystems, and the human/machine system performance results for specific teleoperated tasks. S.L.

**N83-18252*#** Essex Corp., Huntsville, Ala.
**HUMAN OPERATOR PERFORMANCE OF REMOTELY CONTROLLED TASKS: TELEOPERATOR RESEARCH CONDUCTED AT NASA'S GEORGE C. MARSHALL SPACE FLIGHT CENTER. EXECUTIVE SUMMARY Summary Report, 1971 - 1981**
Nicholas Shields, Jr., Frances Piccione, Mark Kirkpatrick, III, and Thomas B. Malone Mar. 1982 27 p refs
(Contract NAS8-31848)
(NASA-CR-170717; NAS 1.26:170717; H-82-01.1) Avail: NTIS HC A03/MF A01 CSCL 05H

The combination of human and machine capabilities into an integrated engineering system which is complex and interactive interdisciplinary undertaking is discussed. Human controlled remote systems referred to as teleoperators, are reviewed. The human factors requirements for remotely manned systems are identified. The data were developed in three principal teleoperator laboratories and the visual, manipulator and mobility laboratories are described. Three major sections are identified: (1) remote system components, (2) human operator considerations; and (3) teleoperator system simulation and concept verification. E.A.K.

**N83-18253*#** Essex Corp., Huntsville, Ala.
**EARTH ORBITAL TELEOPERATOR SYSTEM EVALUATION: TEST REPORT, 1979 - 1980 Interim Report**
Jan. 1981 80 p refs
(Contract NAS8-31848)
(NASA-CR-170718; NAS 1.26:170718; H-81-01) Avail: NTIS HC A05/MF A01 CSCL 05H

Areas which have significant influence upon the engineering design of an operational teleoperator are addressed. Teleoperator lighting systems, thruster systems, and stereoptic visual systems are discussed. The effects of specified levels of several teleoperator subsystems on human operator performance are determined. Four evaluations are reviewed, each dealing with operator performance under various task conditions. A.L.

**N83-18254*#** National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
**LOWER BODY NEGATIVE PRESSURE APPARATUS Patent Application**
William E. Thornton, inventor (to NASA) Filed 2 Sep. 1982 24 p
(NASA-Case-MSC-20202-1; US-Patent-Appl-SN-414106) Avail: NTIS HC A02/MF A01 CSCL 05H

A method and apparatus for simulating gravitational forces on a living organism are described wherein a series of negative pressures are externally applied to successive lengthwise sections of a lower limb of the organism, the pressures decreasing progressively with distance of the limb sections from the heart of the organism. A casing defines a chamber adapted to contain the limb of the organism and is rigidified to resist collapse upon the application of negative pressures to the interior of the chamber. Seals extend inwardly from the casing for effective engagement with the limb of the organism and, in cooperation with the limb, subdivide the chamber into a plurality of compartments each in a negative pressure communicating relation with the limb. Controls apply negative pressures to the compartment and maintain the negative pressures at incrementally different levels in respective ones of the compartments. NASA

**N83-18255#** Army Aeromedical Research Unit, Fort Rucker, Ala. Biomedical Applications Research Div.
**PHYSIOLOGICAL IMPACT OF WEARING AIRCREW CHEMICAL DEFENSE PROTECTIVE ENSEMBLES WHILE FLYING THE UH-1H IN HOT WEATHER Final Report, Nov. 1980 - Aug. 1982**
Francis S. Knox, III, Gerald A. Nagel, Bruce E. Hamilton, Raul P. Olazabal, and Kent A. Kimball Oct. 1982 84 p refs
(DA Proj. 3E1-62777-A-878)
(AD-A121581; USAARL-83-4) Avail: NTIS HC A05/MF A01 CSCL 06/17

Six recent graduates of initial entry rotary wing training flew a UH-1H for up to 4 hours while wearing each of three clothing ensembles. Each aviator wore the standard flight suit, the US chemical defense (CD) ensemble, and the United Kingdom CD ensemble in hot weather (mean WBGT 29 C). Skin temperatures (chest, thigh, upper arm and calf), rectal temperature, heart rate, and preflight and postflight body weights were recorded. Three of six aviators terminated flight for medical reasons (heart rates > 140 bpm or nausea) while wearing the US ensemble. Well acclimatized aviators in this study who did not preflight and drank water every hour were able to fly for at least 2 hours (one fuel load) before the most susceptible subjects had to terminate flight due to heat stress. heart rate was the most susceptible subjects had to terminate flight due to heat stress. Heat rate was the most sensitive indicator of this stress. In this study, these susceptible subjects tended to be older and heavier. Although no measures of cardiopulmonary fitness (e.g., V sub 02 max) were made, it

may be that these susceptible subjects were somewhat less fit. The US ensemble was somewhat more stressful than the UK or standard ensembles. Subjectively all subjects preferred the AR5 respirator to the M24 mask, were divided on overgarment vs undergarment, and most disliked the US overboots. As a caveat it should be stated that fitness alone is not likely to be sufficient to overcome the heat stress induced by these ensembles as flight times are extended. Some sort of cooling will probably be needed. Author (GRA)

**N83-18256#** California Univ., Berkeley. Lawrence Berkeley Lab. Lighting Systems Research.
**RELATING PRODUCTIVITY TO VISIBILITY AND LIGHTING**
Robert Clear and Samuel Berman Jan. 1982 24 p refs Presented at the Public Works Can. Symp. on The Integration of Visual Performance Criteria into the Illumination Design Process, Ottawa, 25-27 Jan. 1982
(Contract W-7405-eng-48)
(DE82-008598; LBL-13931; CONF-820141-1; EEB-L-82-03) Avail: NTIS HC A02/MF A01

The problem of determining the appropriate light levels for visual tasks is a cost benefit problem. Existing light level recommendations seriously underweigh the importance of economic factors. Furthermore, the relative importance of the visibility factors is determining the optimal light levels appears inconsistent with the importance of these factors in determining visibility and visual performance. It is shown that calculations based on acuities give a lower limit of 100 to 200 lux for cost effective light levels for office tasks. Upper limits are calculated from correlations of task performance to visibility levels. Visibility levels become progressively insensitive to luminance as luminance increases. Average power densities above 100 watts per square meter are cost effective only when visibility is very low. However, there is a 3 to 10 times larger increase in benefits from improving contrast or contrast sensitivity than from using more than 10 watts. DOE

**N83-18257#** Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
**ADVANCED AVIONICS AND THE MILITARY AIRCRAFT MAN/MACHINE INTERFACE**
Jul. 1982 341 p refs In ENGLISH and FRENCH Meeting held in Blackpool, England, 26-29 Apr. 1982
(AGARD-CP-329; ISBN-92-835-0315-4) Avail: NTIS HC A15/MF A01

The interfacing of air crews of modern military aircrafts with advanced avionics equipment and systems were discussed. Topics include: (1) use of new advanced displays in aircraft, including multicolor displays, displays incorporating optical techniques, and more reliable display systems; (2) use of voice input/output systems for man machine interface, including speech synthesis; (3) complex avionics systems management; and (4) tactile control and their use. For individual titles, see N83-18258 through N83-18286.

**N83-18258#** Royal Aircraft Establishment, Farnborough (England).
**HUMAN FACTORS IMPLICATIONS OF NEW AVIONIC TECHNIQUES**
F. G. Cumming and J. Laycock *In* AGARD Advan. Avionics and the Mil. Aircraft Man/Machine Interface Jul. 1982 4 p (For primary document see N83-18257 08-54)
Avail: NTIS HC A15/MF A01

Advances in technology particularly in the microelectronics industry which have created a situation where the avionics systems designer has at his disposal a greater number of design options than before, giving him the capability of constructing systems that are more complex than any previously envisaged are discussed. The new techniques available should not only improve on already existing systems but new ideas can be precisely tailored to the pilot's requirements in a way which has not been possible up till now. The pilot will be retained in aircraft of the future because of his unique ability to make decisions in unanticipated situations and for his visual systems capacity to search, detect and recognize visual information present in the outside world. To maximize efficiency the avionic systems should allow unambiguous signals to be passed through his limited capacity channel to produce the minimum number of motor control actions at the output. This may be achieved by: (1) reducing the number of times he is required to close the display/control loop by providing an improved flight control system and a better correlation between the instruments and the outside world; (2) reducing the number of selections of data sources that are required throughout the sortie by introducing automated procedures to take care of plant failures, and providing a more easily operable interface to allow essential interaction with the various systems to be made both fast and accurately. E.A.K.

**N83-18259#** Direction des Recherches Etudes et Techniques, Paris (France). Delegation Generale pour l'Armement.
**THE HUMAN FACTOR IN SYSTEMS HANDLING [LE FACTEUR HUMAIN DANS LE PILOTAGE DES SYSTEMES]**
J. C. Wanner *In* AGARD Advan. Avionics and the Mil. Aircraft Man/Machine Interface Jul. 1982 12 p In FRENCH (For primary document see N83-18257 08-54)
Avail: NTIS HC A15/MF A01

The rules which allow improvement of flight systems security in human factors are just as useful in human performance in man machine interfaces. The security rules were enforced at the certification of the Concord supersonic airplane and were reviewed after a human behavior study for loopholes in the enforcement of the system. E.A.K.

**N83-18260#** Royal Aircraft Establishment, Farnborough (England).
**HUMAN FACTORS CONSIDERATIONS OF THE PERCEPTION OF COLOUR IN THE AIRBORNE ENVIRONMENT**
C. P. Gibson and J. Laycock *In* AGARD Advan. Avionics and the Mil. Aircraft Man/Machine Interface Jul. 1982 9 p refs (For primary document see N83-18257 08-54)
Avail: NTIS HC A15/MF A01

The various CRT technologies in relation to the CIE system of color measurement and the applications and possible pitfalls associated with the use of color as a means of encoding information are discussed. It is suggested that CRTs will become the prime, and certainly the most flexible, display medium in the modern cockpit. The human factors aspects of the use of color are crucial if optimum advantage is to be made of this coding dimension since many areas remain relatively unexplored. The basic mechanisms, and some of the anomalies, of color perception are presented and illustrated. Psychological effects such as the change of perceived hue with luminance, the perceived changes caused by simultaneous color contrast and the effects of chromatic adaptation are outlined. E.A.K.

**N83-18261#** Centre d'Etudes et de Recherches de Medecine Aerospatiale, Paris (France). Dept. de Physiologie et Ergonomie Aerospatiales.
**THE ROLE OF COLOR IN THE SYMBOLS OF AIRCRAFT CONTROL [ROLE DE LA COULEUR DANS LA SYMBOLOGIE DE PILOTAGE DES AERONEFS]**
J. P. Menu and G. F. Santucci *In* AGARD Advan. Avionics and the Mil. Aircraft Man/Machine Interface Jul. 1982 11 p refs In FRENCH (For primary document see N83-18257 08-54)
Avail: NTIS HC A15/MF A01

The presentation of numerous colors can hinder or confuse the grasp of visual information. Several important rules must be set down for using color on supports integrated in a more general concept of piloting and navigation. The vocabulary of photocolorimetry and available techniques are described with emphasis on the cathode ray tube. The correct use of color and the influence of certain environments on color perception are discussed. Physiological problems associated with the use of cathode ray tubes in aeronautics are examined. A.R.H.

**N83-18262#** Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio. Flight Dynamics Lab.
**COLOR DISPLAY FORMATS: A REVOLUTION IN COCKPIT DESIGN**
John M. Reising and Terry J. Emerson *In* AGARD Advan. Avionics and the Mil. Aircraft Man/Machine Interface Jul. 1982 11 p refs

(For primary document see N83-18257 08-54)
Avail: NTIS HC A15/MF A01

Pictorial formats that take full advantage of available graphics and color are discussed. These formats enable the pilot to have entirely new views of his situation. Color formats were developed for head up and head down flight, stores management, and engine and systems monitoring, both in the normal and emergency state. By properly designing pictorial formats to give the pilot a more natural, intuitive view of both the outside world and his aircraft systems, he will become convinced of their utility, and the transition into the electro-optical, full color cockpit will be hastened. E.A.K.

**N83-18263#** Plessey Co. Ltd., Romsey (England). Systems Research Dept.
**THE ASSESSMENT OF COLOUR IN LOFARGRAM DISPLAYS**
J. Metcalfe *In* AGARD Advan. Avionics and the Mil. Aircraft Man/Machine Interface Jul. 1982 4 p refs Sponsored in part by Ministry of Defense of the United Kingdom (For primary document see N83-18257 08-54)
Avail: NTIS HC A15/MF A01

The usefulness of multiple colors in CRT displays was assessed. The assessments performed using Lofargram displays are presented. Three phases are reported: (1) the provision of display equipment; (2) an initial pairs comparison assessment; (3) a final operator trial assessment. It is concluded that multiple colors in the type of display under consideration are not more useful in CRT's than monochrome green. E.A.K.

**N83-18264#** Midwest Systems Research, Inc., Dayton, Ohio.
**ADVANCED DISPLAY FOR COMPLEX FLIGHT TRAJECTORIES**
Peter B. Lovering and Stuart B. Burdess (RAF Staff College) *In* AGARD Advan. Avionics and the Mil. Aircraft Man/Machine Interface Jul. 1982 4 p ref (For primary document see N83-18257 08-54)
Avail: NTIS HC A15/MF A01

Cockpit control and display problems were revealed of complex approach trajectories in support of the Microwave Landing System (MIS) Program. A color graphics display aimed at finding some viable solutions was initiated. The test display format, designed specifically to address orientation and lateral control aspects of the precision approach problem, contained a map display of the approach profile, aircraft attitude, flight direction commands for pitch and a 24 second lateral path predictor. Four colors, green, blue, orange and white were used on a black background for the display elements. Objective performance concerning the desired flight path and pilot opinion on each of the new display features are presented. E.A.K.

**N83-18265#** Rome Air Development Center, Griffiss AFB, N.Y. Communications Div.
**OVERVIEW OF STATE-OF-THE-ART, R&D NATO ACTIVITIES, AND POSSIBLE APPLICATIONS-VOICE PROCESSING TECHNOLOGY**
Bruno Beek *In* AGARD Advan. Avionics and the Mil. Aircraft Man/Machine Interface Jul. 1982 15 p refs (For primary document see N83-18257 08-54)
Avail: NTIS HC A15/MF A01

Voice interactive systems and its role in military applications are discussed. The history and evolution of automatic speech recognition and synthesis is briefly explored and the current state of the art is reviewed. The term voice interactive systems is defined and the advantages and disadvantages of voice interactive systems are highlighted. Previous applications of speech systems to military problems are summarized, the major application areas are described. Important issues to consider when applying voice interactive systems to the aircraft environment are summarized. E.A.K.

**N83-18266#** Fraunhofer-Inst. fuer Informations- und Datenverarbeitung, Karlsruhe (West Germany).
**CHARACTERISTICS OF THE HUMAN INFORMATION CHANNELS AND CONCLUSIONS FOR VOICE INPUT/OUTPUT**
H. Mutschler *In* AGARD Advan. Avionics and the Mil. Aircraft Man/Machine Interface Jul. 1982 8 p refs Sponsored in part by German Federal Ministry of Defence (For primary document see N83-18257 08-54)
Avail: NTIS HC A15/MF A01

Input and output in man machine communication and the specific characteristics of the human oral and aural channels were considered. The channels' modality represents a relevant factor in human information processing, particularly in attention, perception and memory modality specific effects in human infomation processing are presented and applied to the military applications of voice input and output. There is an increase of the human's ability to divide his attention when different modalities are concerned and different subsystems for spatial and verbal informations are involved. Reaction times are generally smaller for auditory than for visual presentation. There is a superior performance of the short term memory for auditorily presented verbal information, if no verbal informations must be handled during the retention period. It is concluded that if modality compatibility between stimulus and response as well as modality coding compatibility is warranted, time consuming transformations can be avoided. E.A.K.

**N83-18267#** Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany). Military Aircraft Div.
**ERGONOMIC REQUIREMENTS FOR VOICE PROCESSING SYSTEMS**
R. Seifert and P. Bubb *In* AGARD Advan. Avionics and the Mil. Aircraft Man/Machine Interface Jul. 1982 13 p refs (For primary document see N83-18257 08-54)
Avail: NTIS HC A15/MF A01

Different voice functions and voice generation methods were examined. Voice functions are verbal warning, verbal threat and guidance information, voice transmission and verbal control of system functions. The voice functions of the audio interface are classified as output, output/input, and input functions. Their application and the methods for voice generation and voice recognition are discussed. Ergonomic requirements for voice generation, transmission and recognition techniques are discussed which are derived based on the articulation index assessment and other technical data. Information oriented requirements are needed concerning the coding and the organization of the information. These requirements aim at optimizing the demand on man's information perception and processing capabilities, resulting from the use of various voice functions. E.A.K.

**N83-18268#** Rome Air Development Center, Griffiss AFB, N.Y.
**APPLICATION, ASSESSMENT AND ENHANCEMENT OF SPEECH RECOGNITION FOR THE AIRCRAFT ENVIRONMENT**
Richard Vonusa, Edward Cupples, Silvi Steigerwald, Jeffrey Woodard, and Joseph Nelson *In* AGARD Advan. Avionics and the Mil. Aircraft Man/Machine Interface Jul. 1982 8 p refs (For primary document see N83-18257 08-54)
Avail: NTIS HC A15/MF A01

Word recognition devices can be used to narrow the bandwidth of voice communication system are discussed. The degree to which the bandwidth can be narrowed is dependent on the vocabulary size and the input word rate, both of which are dependent on the application. Whether these techniques can apply to a particular voice communication system is highly dependent on the communication system's function and on the ability of the automatic speech recognition (ASR) system to operate accurately in the environment. The use of ASR for narrowband communications in the airborne environment is therefore dependent to a large extent on the ability of the ASR device to perform accurately in the harsh airborne environment. The use of ASR for control of airborne functions, to query avionic systems, and for narrowband air-to-air and air-to-ground communications is operationally highly desirable. However, there are several problems associated with the implementation of ASR in the operational environment. One such problem is that of the noisy environment and its effect on ASR performance. The interest in determining if the speech enhancement technology developed for removing noise and interference contained on voice

communication channels can be applied to removing the noise encountered in various other environments. A theoretical measurement method based on information theory was presented that may provide a meaningful ASR measure useful for predicting the performance of a particular ASR device. R.J.F.

**N83-18269#** Marconi Avionics Ltd., Rochester (England). Flight Automation Research Lab.
**DIRECT VOICE INPUT FOR THE COCKPIT ENVIRONMENT**
Ronald Bell, Martin E. Bennett, and William E. Brown *In* AGARD Advan. Avionics and the Mil. Aircraft Man/Machine Interface Jul. 1982 7 p refs Sponsored in part by the United Kingdom Ministry of Defence and the Dept. of Industry (For primary document see N83-18257 08-54)
Avail: NTIS HC A15/MF A01

Many aspects of applying speech recognition technology in aircraft cockpits are discussed, particularly the implications of using Direct Voice Input (DVI) in an aircraft, the current capabilities of speech recognition equipment and how DVI will affect pilot activity. Centralized input media of this type affect the structure of the whole avionics suite because of the need for interconnection with many controlled subsystems and the necessity of high integrity operation. The implications of Direct Voice Input (DVI) system integration are discussed. The requirements for a speech recognition system applicable to the cockpit environment are discussed; in particular the problem of noise is discussed and the need for flight trials highlighted. Any equipment used in the cockpit relies on its acceptability to the pilot for success. The pilot interface question is discussed. R.J.F.

**N83-18270#** General Dynamics Corp., Fort Worth, Tex.
**VOICE INTERACTIVE SYSTEM DEVELOPMENT PROGRAM**
John C. Ruth, A. M. Godwin, and Eric B. Werkowitz (AFFLD) *In* AGARD Advan. Avionics and the Mil. Aircraft Man/Machine Interface Jul. 1982 10 p (For primary document see N83-18257 08-54)
Avail: NTIS HC A15/MF A01

The use of Voice Interactive Systems (VIS) (based on computer recognition and voice synthesis technologies) as a method of achieving an enhanced interaction between the pilot and the weapon systems is discussed. The use of VIS as a viable alternative to the more traditional methods is discussed. Functions which best lend themselves to this approach and offer the highest payoff in terms of overall weapon system performance are discussed. The question of whether the voice recognition technology base can be extended sufficiently to provide reliable operation in the stringent combat aircraft environment is addressed. R.J.F.

**N83-18271#** Army Avionics Research and Development Activity, Fort Monmouth, N. J.
**VOICE INTERACTIVE SYSTEMS TECHNOLOGY AVIONICS (VISTA) PROGRAM**
Lockwood W. Reed *In* AGARD Advan. Avionics and the Mil. Aircraft Man/Machine Interface Jul. 1982 14 p Presented at the Army Sci. Conf., 15-18 Jun. 1982 Previously announced as N82-33383 (For primary document see N83-18257 08-54)
Avail: NTIS HC A15/MF A01

The Avionics Research and Development Activity's (AVRADA) program to introduce voice recognition and response into the Army aircraft environment is discussed. Program structure and preliminary testing results are discussed. Software development, computer installation, algorithm development, and voice recognizer testing techniques are discussed. The signal-to-noise ratio was found to be a key factor in recognition accuracy. Another problem arises because of the automatic gain controls (AGC) found in most aircraft intercom systems. When there is no voicing for a period of time, the AGC increases the intercom sensitivity. If the first utterance spoken is intended for the recognizer it will likely be rejected because of the distortion caused by the AGC adjusting the gain during the utterance. This is demonstrated in the test results of all test subjects. No attempt was made to set the AGC before beginning the test; as a result, 90% of the first utterances were rejected which resulted in the lowering of the accuracy score by approximately 4%. The AGC has a release time of 10 seconds and the prompts are issued every second; therefore, after the first utterance the AGC has little effect. Some side tests were performed by making an utterance before signaling the computer to begin the test, and in each case the accuracy of the first test word increased to a point comparable to the other vocabulary words. R.J.F.

**N83-18272#** Crouzet Aerospace and Systems, Valence (France).
**THE USE OF VOCAL TECHNIQUES IN A COMBAT AIRCRAFT: FIRST INSTRUCTION [UTILISATION DES TECHNIQUES VOCALES DANS UN AVION DE COMBAT: PREMIERS ENSEIGNEMENTS]**
J. R. Costet and J. M. Malterre (Centre d'Essais en Vol) *In* AGARD Advan. Avionics and the Mil. Aircraft Man/Machine Interface Jul. 1982 8 p (For primary document see N83-18257 08-54)
Avail: NTIS HC A15/MF A01

The definition of a cockpit with reduced available frontal surface because of the inclination of the pilot's seat is among the several reasons given for growing interest in speech recognition and synthesis for future combat aircraft. Techniques used and problems encountered in a program designed to study and experiment with vocal dialog on such aircraft are described. The program aims to validate the recognition techniques in a military environment, supply data to a data base for defining how, according to what criteria, and what types of functions of vocal dialog can be applied. An ergonometric experiment in a simulator seeks to study the insertion of vocal dialog into a phase of flight corresponding to a realistic workload known in advance. Flight tests are planned to attempt to synthesize on board the aircraft, a modern weapon system with functional dialog and operational functions.
Transl. by A.R.H.

**N83-18273#** Royal Air Force Inst. of Aviation Medicine, Farnborough (England).
**PERFORMANCE DECREMENTS ASSOCIATED WITH REACTION TO VOICE WARNING MESSAGES**
John Wheale *In* AGARD Advan. Avionics and the Mil. Aircraft Man/Machine Interface Jul. 1982 12 p refs (For primary document see N83-18257 08-54)
Avail: NTIS HC A15/MF A01

Voice warning messages are being adopted as an alternative to audio warnings because they can be readily understood, generate fast reaction times and supposedly allow a smooth transition from message to action. The effectiveness of synthesized voice message using measures of performance decrement and response time in the context of a central warning system with audio, voice and visual indicators was evaluated. The subject's task was to maintain accuracy on a psychomotor tracking task while responding to warnings. The results show that the various combinations of warning types could not be differentiated with respect to performance decrement on the primary task. The data for reaction time show that audio warnings produce the fastest responses, followed by voice warnings, with central warning panel indicators producing the slowest responses. The implications of the results for the role of synthesized voice warning messages in central warning systems are discussed. R.J.F.

**N83-18274#** Marconi Co. Ltd., Basildon (England). Airadio Products Div.
**COMMUNICATIONS MANAGEMENT: A VITAL LINK**
W. E. Brierley *In* AGARD Advan. Avionics and the Mil. Aircraft Man/Machine Interface Jul. 1982 19 p (For primary document see N83-18257 08-54)
Avail: NTIS HC A15/MF A01

A method by which additional radio equipment can be fitted to light helicopters, preferably by reduction in the already allocated panel area, together with increased control facilities is investigated. A unit is being designed which will provide the required facilities within a panel area only 35% of that required for the controllers it replaces, whilst still providing all the functions required. The proposed Communications Management System control panel

provides in one unit the facilities for two pilots to: select control, and display any one of six transmitter-receivers; monitor and/or independently change the frequency or pre-set channel of the selected radio; transmit/receive on the selected radio; select and adjust any or all in any combination eight radio receiver outputs and other audios; monitor and adjust pre-set channels on the left hand display whilst maintaining normal opertion on the right hand station; and direct emergency selection of guard channels for UHF, VHF, TAC VHF in the event of system failure. The system is organised to ensure that when a radio is selected, the only frequencies that can be selected are within the particular radio band, or if a pre-set channel is selected, only channels applicable to the selected radio are available. R.J.F.

**N83-18275#** Royal Aircraft Establishment, Farnborough (England). Human Factors Group.
**FACTORS AFFECTING THE ALLOCATION OF ATTENTION AND PERFORMANCE IN CROSSMONITORING FLIGHT INFORMATION DISPLAYS**
V. P. Schmit *In* AGARD Advan. Avionics and the Mil. Aircraft Man/Machine Interface Jul. 1982 6 p refs Originally announced as X83-71276 (For primary document see N83-18257 08-54)
Avail: NTIS HC A15/MF A01

Experiments on rapid and continuous visual attention switching between spatially separated aircraft cockpit displays are discussed. It was concluded that reversion to a head-up display (HUD) format imposes a significant time cost (in this experiment 3.5 to 4 seconds) before full appreciation of aircraft status is restored. The HUD format gave more accurate flying performance than the head down instrument (HDI) format. This performance was reduced at reversion, even when reversion was to another HUD format, indicating disruption. Reverting from a HDI format to a HUD format improved performance due to the inherently better display of information on the HUD for the type of flying imposed in this experiment. Reversion from a HDI format took longer when this display had been used for periods longer than 60 seconds - this may be interpreted as the time necessary to establish a scanning pattern and the interference resulting from its disturbance. The results taken as a whole suggest that any reversionary flight display should exhibit: minimum scanning requirements; display integrality; and the minimum readjustment required from the pilot at reversion. R.J.F.

**N83-18276#** British Aerospace Aircraft Group, Brough (England).
**THE HEAD UP HANDS BACK CONTROL CONCEPT**
G. Roe *In* AGARD Advan. Avionics and the Mil. Aircraft Man/Machine Interface Jul. 1982 12 p refs (For primary document see N83-18257 08-54)
Avail: NTIS HC A15/MF A01

The rationale for a new aircraft control concept is developed by reviewing how current systems are controlled and what operational problems are experienced. Based on discussions of the potential offered by digital data transmission, of intelligent subsystems and a definition of the fundamental human factors requirements, a control concept is presented which requires little, if any head down activities. Results from human factors experiments reveal a consistent trend towards reduced times to complete various complex switch sequences while related errors are reduced. R.J.F.

**N83-18277#** Thomson-CSF, Issy les Moulineaux (France). Dept. AVG.
**A MORE EXTENDED INTEGRATION FOR COMBAT AIRCRAFT VISUALIZATIONS [UNE INTEGRATION DE PLUS EN PLUS POUSSEE POUR LES VISUALISATIONS DES AVIONS DE COMBAT]**
C. Maureau *In* AGARD Advan. Avionics and the Mil. Aircraft Man/Machine Interface Jul. 1982 6 p In FRENCH (For primary document see N83-18257 08-54)
Avail: NTIS HC A15/MF A01

Attempts to determine what can be done to significantly improve flight control on combat aircraft practically always result in revealing the need or further extending systems integration. This end is most often obtained by using technological progress particularly information visualization and means at the pilots disposal for exploiting this information. Certain modern equipment in the cabin of the Mirage 2000 aircraft just entering service is reviewed. An analog examination follows on projects for equipping the cabin of a next generation combat aircraft. These projects are elaborated by a working group of equipment suppliers and aircraft designers that was established to integrate systems for future aircraft with the pilots who will use them. Transl. by A.R.H.

**N83-18278#** Royal Air Force Inst. of Aviation Medicine, Farnborough (England).
**HUMAN FACTORS IN AIRCRAFT KEYBOARD DESIGN: STANDARDS, ISSUES AND FURTHER EVIDENCE RELATING TO GLOVES AND KEY CHARACTERISTICS**
R. M. Taylor and J. V. F. Berman *In* AGARD Advan. Avionics and the Mil. Aircraft Man/Machine Interface Jul. 1982 17 p refs (For primary document see N83-18257 08-54)
Avail: NTIS HC A15/MF A01

The aircraft pilot is increasingly required to interact with complex digital avionics systems. These systems often require data to be input in digital form. Keyboards provide a logical and convenient interface for performing this task. Surveys of the literature reveal some human factors evidence relevant to aircraft keyboard design, but most of the work is based on the requirements of ground applications, and this is not readily generalized to aircraft environments. Keyboard factors affecting data entry performance include keyboard positioning and layout, key size, actuation force, pre- and post-actuation travel, visual and tactile feedback, key separation and barriers. Other factors include the effects of aircrew gloves on manipulative ability, tactility and hand/finger dimensions, operator comfort, fatigue and aircraft vibration, the level of skill of the operator, the cognitive and physical components of the data entry task and the interference between keyboard data entry and other tasks performed concurrently in the cockpit. The current status of human factors knowledge in these areas are reviewed and the results of recent experiments conducted at the RAF Institute of Aviation Medicine are discussed in relation to keyboard standardization agreements and aircrew training. B.W.

**N83-18279#** Systems Research Labs., Inc., Dayton, Ohio.
**PILOT-MACHINE INTERFACE CONSIDERATIONS FOR ADVANCED AIRCRAFT AVIONICS SYSTEMS**
Gloria L. Calhoun and Emmett L. Herron (General Dynamics) *In* AGARD Advan. Avionics and the Mil. Aircraft Man/Machine Interface Jul. 1982 7 p refs (For primary document see N83-18257 08-54)
(Contracts F33615-73-C-0391; F33615-76-C-0013; F33615-79-C-0503)
Avail: NTIS HC A15/MF A01

Aircrew acceptance of computer-driven controls depends largely on the successful establishment of the pilot-machine interface. Research was conducted to determine pilot acceptability and usability of one type of interface device--a multifunction control which integrates many aircraft functions onto a single, easily reached control panel. In each study, pilots completed communications, navigation, and weapons tasks on the control while flying simulated missions. This paper discusses some of the design guidelines identified during the studies as critical to the design of the interface. Topics addressed include how to identify functions to implement on a multifunction control, maximize accessibility of frequently used functions, optimize switch/function assignment, label switches, verify selections, and minimize hand motion and errors. B.W.

**N83-18280#** Twente Univ. of Technology, Enschede (Netherlands).
**LIMITING PERFORMANCE OF THE EYE/DISPLAY SYSTEM**
D. Bosman and F. W. Umbach *In* AGARD Advan. Avionics and the Mil. Aircraft Man/Machine Interface Jul. 1982 15 p refs (For primary document see N83-18257 08-54)
Avail: NTIS HC A15/MF A01

The performance and its limits of the CRT as used in both

the recreational sector and professional applications such as aircraft displays, have been extensively researched and described. The new generation of flat panel display devices have image generation properties which are sufficiently different from those of the CRT to require additional ergonomic investigations. In particular, the structural information (spatial domain) does not allow such operations as analogue low pass filtering based on partial overlap of pixels: the image remains tesselated because of the display technology involved, wherein pixels are formed by recticulation of the light modulating or emitting display surface. Also a wide dimming range is necessary to ensure good legibility over the whole ambient luminance range as encountered in cockpit environments. These aspects will be given attention with the human visual characteristics as a reference; recommended display specifications are derived. B.W.

**N83-18281#** Elliott-Automation Space and Advanced Military Systems Ltd., Frimley (England).
**ARCHITECTURE FOR HIGH INTEGRITY DISPLAY SYSTEMS IN FUTURE COMBAT AIRCRAFT**
J. A. Grice *In* AGARD Advan. Avionics and the Mil. Aircraft Man/Machine Interface Jul. 1982 13 p refs (For primary document see N83-18257 08-54)
Avail: NTIS HC A15/MF A01

Present indications are that the next generation of combat aircraft will require both Air Defence and Ground Attack capabilities leading to a complex Avionic system. Three different System Architectures have been considered for this complex system with a trend towards a hierarchical system. A Mil-Std-1553B Data Bus has been assumed as the interface standard for the Avionics Bus. Problems of Bus traffic loading, reversionary capability and software location have been investigated. Particular attention has been paid to the Display requirements in terms of number and type of display surfaces and the different display formats are suggested. Some of the implications of giving the pilot flexibility to allocate display formats to different displays are increases in Bus traffic, bus control logic and software. The reliability of the different displays configurations is discussed. Author

**N83-18282#** Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
**ELECTROLUMINESCENT LIGHTING AND OTHER TECHNIQUES FOR IMPROVING NIGHT VISION GOGGLES COMPATIBILITY WITH COCKPIT DISPLAYS**
Harry Lee Task and Leonard L. Griffin *In* AGARD Advan. Avionics and Mil. Aircraft Man/Machine Interface Jul. 1982 6 p refs (For primary document see N83-18257 08-54)
Avail: NTIS HC A15/MF A01

Standard night lighting for most aircraft cockpits results in a lighting configuration that is not compatible with the use of night vision goggles. One specific example discussed in this paper is the US Air Force PAVE LOW III helicopter; a modified version of the HH-53H. Both wavelength and geometric light control techniques were developed and applied to this cockpit to make it compatible with the night vision goggles. A combination of light control film (3-M micro-louvre), color filters, infra-red blocking filters, electroluminescent light and anti-flare baffles were used to successfully retrofit the cockpit for night vision goggle use. In addition, some of the techniques are applicable to reducing windscreen reflection, thus, improving unaided night vision through the windscreen. Author

**N83-18283#** Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. Crew Systems Effectiveness Branch.
**THE HELMET-MOUNTED HUD: A CHANGE IN DESIGN AND APPLICATIONS APPROACH FOR HELMET-MOUNTED DISPLAYS**
John Bridenbaugh, William Kama, and Harry Lee Task *In* AGARD Advan. Avionics and the Mil. Aircraft Man/Machine Interface Jul. 1982 6 p refs (For primary document see N83-18257 08-54)
Avail: NTIS HC A15/MF A01

Recent studies at the USAF Aerospace Medical Research Laboratory (AFAMRL) have been directed at the introduction of a flexible fiber optics bundle (FFOB) to relay alphanumber/symbolic information from a Cathode Ray Tube (CRT) located off the helmet in order to provide Head-Up Display (HUD) equivalent display information. This approach results in less weight and size, the potential for increased brightness and the removal of high voltage from the helmet. In addition to these improved hardware characteristics several visual problems are avoided by this simple configuration. This paper will examine the rationale for such a design approach as well as present results of laboratory studies to assess the effect of FFOB fiber density on symbol legibility for a Helmet-Mounted Head-Up Display (HMHUD). Author

**N83-18284#** Pilkington P.E. Ltd., St. Asaph (England).
**DIFFRACTIVE OPTICS FOR AVIONIC DISPLAYS**
D. W. Swift *In* AGARD Advan. Avionics and the Mil. Aircraft Man/Machine Interface Jul. 1982 8 p (For primary document see N83-18257 08-54)
Avail: NTIS HC A15/MF A01

The paper describes what diffractive optical elements are, how they work, and how they are made. It explains in broad terms how the properties of one special class of these elements (conformal holograms) are being used to design Head Up Displays with larger instantaneous fields of view than the current generation and with improved photometric performance, but notes some of the attendant problems. Author

**N83-18285#** Royal Aircraft Establishment, Farnborough (England). Flight Systems Dept.
**WIDE FIELD OF VIEW HEAD-UP DISPLAYS**
J. R. Banbury *In* AGARD Advan. Avionics and the Mil. Aircraft Man/Machine Interface Jul. 1982 11 p refs (For primary document see N83-18257 08-54)
Avail: NTIS HC A15/MF A01

The head-up displays currently fitted to production aircraft have a restricted field of view caused by the relatively small diameter of the collimating optics. There is a growing interest in alternative designs which make a greater field of view available to the pilot. Several possible design options for achieving a wide field are outlined. The new methods usually rely on the properties of diffractive optical elements to achieve a satisfactory performance with respect to accuracy, photometric efficiency and sunlight rejection. Some advantages arising from the particular characteristics of diffractive elements are considered. As wide field of view displays become more readily available it is important to establish whether the additional cost and bulk of the equipment is justified by gains in operational efficiency. The paper concludes outlining some possible uses of the larger field. B.W.

**N83-18286#** Ferranti Ltd., Edinburgh (Scotland).
**THE F18 HORIZONTAL INDICATOR OPTICAL SYSTEM**
Alan Boot *In* AGARD Advan. Avionics and the Mil. Aircraft Man/Machine Interface Jul. 1982 7 p ref (For primary document see N83-18257 08-54)
Avail: NTIS HC A15/MF A01

The design of cockpit displays which are both visible in sunlight, and which whilst visible at night do not significantly interfere with the pilot's normal night time operation present the designer with a significant challenge. Such a display outlines the operational environment and the optical performance requirements of the F18 HI, and the technical solutions which have been adopted in order to satisfy these requirements. In particular, the means of combining the Map and CRT images and achieving intrinsically high brightness, contrast and resolution figures are discussed, as is the mechanism for generating the accurately controlled exit pupil which impacts significantly on both the high and low ambient illumination performance. The use of lightweight fresnel lenses and the associated problems which have been encountered are also highlighted. In conclusion, a comparison is drawn between the achievable performance with this and alternative display systems. Author

**N83-18225#** Joint Publications Research Service, Arlington, Va.
**CHANGES IN SOME BIOCHEMICAL PARAMETERS OF BLOOD**

**AS A FUNCTION OF PROGRAM OF ACCELERATIONS**
J. Domaczuk *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 6, Nov. - Dec. 1982 (JPRS-82654) 17 Jan. 1983 p 131-134 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 16, no. 6, Nov. - Dec. 1982 p 87-89 (For primary document see N83-18200 08-51)
Avail: NTIS HC A08/MF A01

**N83-17469#** United Air Lines, Inc., Denver, Colo.
**PILOT/AIRCRAFT FUEL PERFORMANCE EVALUATION**
Gordon A. McKinzie *In* DOE Symp. on Com. Aviation Energy Conserv. Strategies Apr. 1981 p 281-306 (For primary document see N83-17455 08-01)
Avail: NTIS HC A17/MF A01 CSCL 01/2

**N83-17495#** Air Force Inst. of Aviation Medicine, Fuerstenfeldbruck (West Germany).
**HUMAN FACTORS**
Gerd O. Spohd *In* AGARD Human Factors Aspects of Aircraft Accidents Oct. 1982 18 p refs (For primary document see N83-17490 08-01)
Avail: NTIS HC A07/MF A01

**N83-17498#** Royal Air Force Inst. of Aviation Medicine, Farnborough (England).
**LIFE SUPPORT, RESTRAINT AND EJECTION SYSTEMS INVESTIGATION**
D. J. Anton *In* AGARD Human Factors Aspects of Aircraft Accidents Oct. 1982 7 p refs (For primary document see N83-17490 08-01)
Avail: NTIS HC A07/MF A01

# 55 PLANETARY BIOLOGY

Includes exobiology and extraterrestrial life.

No abstracts in this category.

# 59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

No abstracts in this category.

# 60 COMPUTER OPERATIONS AND HARDWARE

Includes computer graphics and data processing.

For components see *33 Electronics and Electrical Engineering.*

**N83-18287** National Physical Lab., Teddington (England). Div. of Information Technology and Computing.
**ADA-EUROPE GUIDELINES FOR ADA COMPILER SPECIFICATIONS AND SELECTION**
John C. D. Nissen, Brian A. Wichmann, Ted Dowling, Stephen Goldsack, Hans Jeanrod, Alan Montgomery, Ron Pierce, Mario Refice, Nguyen theThang, Sven Tafvelin et al Oct. 1982 33 p refs
(NPL-DITC-10/82; ISSN-0262-5369) Copyright. Avail: Issuing Activity

The Ada language reference manual defines the language rather than indicating a list of the desirable properties of an implementation of the language. The characteristics of an implementation that should be taken into account in the specification or selection of an Ada compiler are listed. S.L.

**N83-18288*#** Iowa Univ., Iowa City.
**TESTING THE BUS GUARDIAN UNIT OF THE FTMP**
Manoj Kumar Jha and John P. Robinson Jan. 1983 22 p refs (Grant NAG1-195)
(NASA-CR-169863; NAS 1.26:169863) Avail: NTIS HC A02/MF A01 CSCL 09B

Fault-tolerant multiprocessor (FTMP) operation is discussed. Fault-modeling in the bus guardian units (BGUs) is covered. Testing the BGU is discussed. A testing algorithm is proposed. Author

**N83-18289*#** Michigan Univ., Ann Arbor. Dept. of Electrical and Computer Engineering.
**QUEUEING ANALYSIS OF A CANONICAL MODEL OF REAL-TIME MULTIPROCESSORS**
C. M. Krishna and K. G. Shin 6 Feb. 1983 26 p refs (Grant NAG1-296)
(NASA-CR-169873; NAS 1.26:169873) Avail: NTIS HC A03/MF A01 CSCL 09B

A logical classification of multiprocessor structures from the point of view of control applications is presented. A computation of the response time distribution for a canonical model of a real time multiprocessor is presented. The multiprocessor is approximated by a blocking model. Two separate models are derived: one created from the system's point of view, and the other from the point of view of an incoming task. Author

**N83-18290*#** National Aeronautics and Space Administration. Pasadena Office, Calif.
**DISTRIBUTED MULTIPORT MEMORY ARCHITECTURE Patent Application**
Wayne H. Kohl, inventor (to NASA) (JPL, California Inst. of Tech., Pasadena) Filed 30 Apr. 1981 26 p Sponsored by NASA
(NASA-Case-NPO-15342-1; US-Patent-Appl-SN-258623) Avail: NTIS HC A03/MF A01 CSCL 09B

A multiport memory architecture is disclosed for each of a plurality of task centers connected to a command and data bus. Each task center includes a memory and devices which request direct memory access as needed. The memory includes an internal data bus and an internal address bus to which the devices are connected, and direct timing and control wgic comprised of a 10-state ring counter for allocating memory devices by enabling AND gates connected to the request signal lines of the devices. NASA

**N83-18291#** National Aerospace Lab., Amsterdam (Netherlands). Flight Div.
**COMPUTERS IN AVIONICS SYSTEMS**
F. J. Abbink 25 Dec. 1981 35 p refs In DUTCH; ENGLISH summary Presented at Computer Technol. Symp., Delft, 19 Jan. 1982
(NLR-MP-81063-U) Avail: NTIS HC A03/MF A01

Avionics provide functions related with flight control, navigation, communication, systems monitoring and presentation of flight, warning and systems information. The avionics concept for airliners and the role of microelectronics, microcomputers and modern display technology to reduce fuel consumption and flight crew workload are described. S.L.

**N83-18292#** California Univ., Livermore. Lawrence Livermore Lab.
**MINI AND MICROCOMPUTER USE AT LAWRENCE LIVERMORE NATIONAL LABORATORY: PAST, PRESENT AND FUTURE**
Arthur M. Krakowsky 19 Nov. 1981 25 p
(Contract W-7405-eng-48)
(DE82-005737; UCID-19276) Avail: NTIS HC A02/MF A01

In early 1981, the Electronics Engineering Department Head initiated a study of mini and microcomputer use at Lawrence Livermore National Laboratory (LLNL). The purpose was to establish a firm foundation for making certain management

decisions about computer acquisition. LLNL has been and will continue to be an enthusiastic user of DEC equipment. DEC is likely to supply well over half, but certainly not all, of the minicomputers that LLNL's programs will require. The economy of scale achieved by using a large number of one vendor's products has resulted in an impressive savings in time and dollars. It has provided our programs with a highly trained, mobile staff of engineers who can apply their previously gained software and hardware knowledge to current tasks. The data do not indicate any danger of becoming dependent on a single vendor. DOE

**N83-18293#** California Univ., Livermore. Lawrence Livermore Lab.
**TOWARDS A GENERALIZED COMPUTER CONTROL SYSTEM: A CONDENSED ANALYSIS**
Glen Speckert, Charles Grant, and Doug Guenther 2 Nov. 1981 5 p refs Presented at the 9th Symp. on Eng. Probl. of Fusion Res., Chicago, 26-29 Oct. 1981
(Contract W-7405-eng-48)
(DE82-006734; UCRL-86885; CONF-811040-144) Avail: NTIS HC A02/MF A01

Computerized control systems have been written for a variety of complex but similar machines, notably large fusion experiments and accelerators. A number of independent software solutions have emerged as a result, each tailored to their specific control application. A general software structure may exist which can be used in many control environments. A preliminary analysis of the structure of control systems and a strategy for a control system which can be used for a wide domain of target machines are presented. DOE

**N83-18294#** Kent Univ., Canterbury (England). Computing Lab.
**THE UNIVERSITY OF KENT, CANTERBURY, FILE SERVER**
Mike J. Bayliss 1982 36 p refs
(PB82-245358; UKC-Computing-Lab-12) Avail: NTIS HC A03/MF A01 CSCL 09B

The file server is a data-storage facility which provides facilities for accessing individual files and control of the file system in which these files reside. The file server imposes no structure on the files it holds. The file server provides a set of primitive operations applicable to any file held on the file server. In addition a hierachic directory structure is provided, along with the primitives necessary to manipulate this directory structure. GRA

**N83-18295#** Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
**DISTRIBUTED MICRO-PROCESSOR APPLICATIONS TO GUIDANCE AND CONTROL SYSTEMS**
Louis J. Urban, ed. (Aeronautical Systems Div.) Jul. 1982 113 p
(AGARD-AR-178; ISBN-92-835-1428-9) Avail: NTIS HC A06/MF A01

Microprocessor technology is described. Guidance and control architecture is detailed. A lexicon of terminology is provided. Standardization is highlighted. For individual titles, see N83-18296 through N83-18299.

**N83-18296#** Milco International, Inc., Huntington Beach, Calif.
**MICROPROCESSOR TECHNOLOGY**
Richard K. Smyth *In* AGARD Distributed Micro-Process. Appl. to Guidance and Control Systems Jul. 1982 p 1-60 (For primary document see N83-18295 08-60)
Avail: NTIS HC A06/MF A01

The current microprocessor technology state-of-the-art is examined, and important technology trends are identified. An overview of the current technology is provided. Author

**N83-18297#** Boeing Military Airplane Development, Seattle, Wash.
**MICROPROCESSOR APPLICATIONS TO GUIDANCE AND CONTROL ARCHITECTURES**
Richard F. Bousley *In* AGARD Distributed Micro-Process. Appl. to Guidance and Control Systems Jul. 1982 p 61-84 (For primary document see N83-18295 08-60)
Avail: NTIS HC A06/MF A01

A sample of techniques now being examined for use of microprocessor hardware and software in future military G&C systems is presented. Some current and proposed architectures are discussed. The structure of the basic types of architectures is examined. Computational considerations are presented as well as software and fault tolerance considerations for each type of architecture. These architectures are applied to integrated G&C systems for generic types of aircraft. A comparison of benefits through the use of each of these types of architecture made possible through the use of microprocessors is presented. Author

**N83-18298#** Honeywell, Inc., Minneapolis, Minn.
**MICROPROCESSOR AND DIGITAL SYSTEMS TERMINOLOGY AND NOMENCLATURE**
Thomas B. Cunningham *In* AGARD Distributed Micro-Process. Appl. to Guidance and Control Systems Jul. 1982 p 85-100 (For primary document see N83-18295 08-60)
Avail: NTIS HC A06/MF A01

A list of computer terminology is provided. N.W.

**N83-18299#** Cranfield Inst. of Tech., Bedfordshire (England). School of Electronic System Design.
**OPTIONS AND OPPORTUNITIES FOR STANDARDS**
John T. Shepherd *In* AGARD Distributed Micro-Process. Appl. to Guidance and Control Systems (For primary document see N83-18295 08-60)
Avail: NTIS HC A06/MF A01

Microprocessor standards are discussed. N.W.

# 61 COMPUTER PROGRAMMING AND SOFTWARE

Includes computer programs, routines, and algorithms.

**N83-18300** Royal Signals and Radar Establishment, Malvern (England).
**IN PRAISE OF PROCEDURES**
Ian F. Currie Jul. 1982 21 p refs
(RSRE-3499; BR85316) Copyright. Avail: Issuing Activity

The use of procedures vary greatly from one programming language to another. These variations are discussed and the use of procedures in a very general fashion is argued; in particular, procedures are an obvious vehicle to provide the data abstraction and encapsulation given in a very limited form by other language constructs such as ADA packages. The implementation of these general procedural values is also discussed with reference to the Flex computer. Author

**N83-18301** Royal Signals and Radar Establishment, Malvern (England).
**FLEX: A WORKING COMPUTER WITH AN ARCHITECTURE BASED ON PROCEDURE VALUES**
J. M. Foster, I. F. Currie, and P. W. Edwards Jul. 1982 18 p refs
(RSRE-3500; BR85111) Copyright. Avail: Issuing Activity

The Flex computer architecture is described, and the procedure values, especially for operating systems, are illustrated. Author

**N83-18302** Royal Signals and Radar Establishment, Malvern (England).
**GEMINI MICROPROGRAMMER'S HANDBOOK**
J. Kershaw Sep. 1982 38 p
(RSRE-82015; BR85562) Copyright. Avail: Issuing Activity

Documents relating to the GEMINI microprogrammed emulation system are computed. The information needed by users of GEMINI, and particularly by microprogram writers is provided. Author

**N83-18303** Stuttgart Univ. (West Germany). Inst. of Switching and Data Techniques.
**THIRTY-SECOND REPORT ON STUDIES IN CONGESTION THEORY. ON THE DIMENSIONING OF LINK SYSTEMS WITH**

**POINT TO POINT SELECTION AND ALTERNATE ROUTING**
Nagy Wadie Mesaina 1981 81 p refs In GERMAN; ENGLISH summary
Copyright. Avail: Issuing Activity

The structure of telephone link systems and the various investigated link system types, as well as the strategy of alternate routing are considered. The procedure of alternate routing in case of point to point selection is described. A list of all parameters to be calculated is described. Author

**N83-18304*#** Boeing Commercial Airplane Co., Seattle, Wash.
**USER'S MANUAL FOR MASTER: MODELING OF AERODYNAMIC SURFACES BY 3-DIMENSIONAL EXPLICIT REPRESENTATION Final Report**
S. G. Gibson Jan. 1983 164 p refs
(Contract NAS1-15325-10)
(NASA-CR-166056; NAS 1.26:166056; D6-51088; B-8406) Avail: NTIS HC A08/MF A01 CSCL 09B

A system of computer programs was developed to model general three dimensional surfaces. Surfaces are modeled as sets of parametric bicubic patches. There are also capabilities to transform coordinates, to compute mesh/surface intersection normals, and to format input data for a transonic potential flow analysis. A graphical display of surface models and intersection normals is available. There are additional capabilities to regulate point spacing on input curves and to compute surface/surface intersection curves. Input and output data formats are described; detailed suggestions are given for user input. Instructions for execution are given, and examples are shown. J.M.S.

**N83-18305*#** Mississippi Univ., University.
**A STUDY OF HIGH DENSITY BIT TRANSITION REQUIREMENTS VERSUS THE EFFECTS ON BCH ERROR CORRECTING CODES Final Report**
Frank M. Ingels and William O. Schoggen 6 Jan. 1983 93 p refs
(Contract NAS8-33887)
(NASA-CR-170713; NAS 1.26:170713; MSSU-EIRS-EE-83-1) Avail: NTIS HC A05/MF A01 CSCL 09B

The use of PN sequence generators to create a minimum number of transitions in an NRZ bit stream is described. The CSG encoder/decoder design was constructed and demonstrated. S.L.

**N83-18306*#** Michigan Univ., Ann Arbor. Computing Research Lab.
**ANALYSIS OF BACKWARD ERROR RECOVERY FOR CONCURRENT PROCESSES WITH RECOVERY BLOCKS**
Kang G. Shin and Yann-Hang Lee [1982] 28 p refs
(Grant NAG1-296)
(NASA-CR-169871; NAS 1.26:169871) Avail: NTIS HC A03/MF A01 CSCL 09B

Three different methods of implementing recovery blocks (RB's). These are the asynchronous, synchronous, and the pseudo recovery point implementations. Pseudo recovery points so that unbounded rollback may be avoided while maintaining process autonomy are proposed. Probabilistic models for analyzing these three methods under standard assumptions in computer performance analysis, i.e., exponential distributions for related random variables were developed. The interval between two successive recovery lines for asynchronous RB's mean loss in computation power for the synchronized method, and additional overhead and rollback distance in case PRP's are used were estimated. Author

**N83-18307*#** North Carolina State Univ., Raleigh. Dept. of Electrical Engineering.
**A STUDY OF REAL-TIME COMPUTER GRAPHIC DISPLAY TECHNOLOGY FOR AERONAUTICAL APPLICATIONS Final Report, Jan. 1977 - Sep. 1982**
S. A. Rajala and L. R. Blume May 1983 165 p refs
(Grant NsG-1355)
(NASA-CR-169828; NAS 1.26:169828) Avail: NTIS HC A08/MF A01 CSCL 09B

Hardware, algorithms and software for real-time raster graphics were designed and implemented. Author

**N83-18308#** Politecnico di Milano (Italy). Lab. di Calcolatori.
**A USABLE RATFOR ENVIRONMENT FOR NON-NUMERICAL PROCESSING**
A. Celentano Dec. 1981 32 p refs Sponsored by CNR and Centro di Studio per l'Ingegneria dei Sistemi per l'Elaborazione delle Informazioni
(Rept-81-20) Avail: NTIS HC A03/MF A01

An implementation of a Ratfor environment suited for non-numerical programming, in particular text processing is described. The environment is composed of a Ratfor precompiler, tailored to the host operating system, and a library of functions and subroutines for efficient processing of alphanumeric data, with a particular emphasis on input/output of character strings. Functions for interfacing the operating system for running programs and obtaining execution directives are included. The environment was used for more than two years on a PDP11/34 under RSX-11M operating system; during this period several programs for text processing, and a complete translator writing system, were constructed. The results of this experience are discussed. Author

**N83-18309#** Royal Inst. of Tech., Stockholm (Sweden). Dept. of Numerical Analysis and Computing Science.
**KNOWLEDGE-BASED IMAGE ANALYSIS: SOME ASPECTS ON THE ANALYSIS OF IMAGES USING OTHER TYPES OF INFORMATION**
Jan-Olof Eklundh 1982 16 p refs
(TRITA-NA-8206) Avail: NTIS HC A02/MF A01

The computer vision approach to image analysis is discussed from two aspects. First, this approach is constrasted to the pattern recognition approach. Second, how external knowledge and information and models from other fields of science and engineering can be used for image and scene analysis is discussed. In particular, the connections between computer vision and computer graphics are pointed out. L.F.M.

**N83-18310#** Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Computer Science.
**CONDITIONAL REWRITE RULES: CONFLUENCY AND TERMINATION**
J. A. Bergstra (Leiden Univ.) and J. W. Klop May 1982 54 p refs Submitted for publication
(MC-IW-198/82) Avail: NTIS HC A04/MF A01

Algebraic specifications of abstract data types can often be viewed as systems of rewrite rules. Here we consider rewrite rules with conditions, such as they arise, e.g., from algebraic specifications with positive conditional equations. The conditional Term Rewriting Systems thus obtained are based upon the well known class of left linear, nonambiguous TRS's. A large part of the theory for such TRS's can be generalized to the conditional case. The approach taken is nonhierarchical: the conditions are to be evaluated in the same rewriting system. Confluency results and termination results for some well known reduction strategies are proved. B.W.

**N83-18311#** Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Computer Science.
**FAIRNESS ASSUMPTIONS FOR CSP IN A TEMPORAL LOGIC FRAMEWORK**
R. Kuiper and W. P. deRoever (Utrecht Univ.) May 1982 13 p refs Presented at IFIP WG 2.2 Working Conf. on Formal Description of Programming Concepts 2 Submitted for publication Sponsored by Netherlands Organ. for the Advancement of Pure Research (ZWO) and Weizmann Inst. of Science
(MC-IW-199/82) Avail: NTIS HC A02/MF A01

Six fairness assumptions for the repetitive construct [...(square)b sub I, c sub I yields S sub I(square)...] in a subset of communicating sequential processes (CSP) are given and classified with respect to the programs they cause to terminate. A total correctness proof system for the subset of CSP is given, incorporating the different fairness assumptions. M.G.

**N83-18312#** Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Computer Science.
**DECIDING EQUIVALENCE OF FUNCTIONAL SCHEMES FOR PARALLEL PROGRAMS**
Y. P. Korablin Jul. 1982 36 p refs Submitted for publication
(MC-IW-200/82) Avail: NTIS HC A03/MF A01

This paper presents two formal systems for proving equivalence of parallel programs. The second system, which is an extension of the first system, is developed on the base of the proof system constructed. A completeness result is obtained for a certain subset of expressions of the second system. In particular, this subset includes all expressions of the first system. The method we use for proving equivalence of parallel programs exhibits a formal resemblance to the method used by SALOMAA for proving equivalence of expressions in the algebra of regular events. B.W.

**N83-18313#** Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Computer Science.
**THE DETAILED SEMANTICS OF GRAPHICS INPUT DEVICES**
David S. H. Rosenthal, James C. Michener (Intermetric, Inc., Cambridge, Mass.), Guenther PFaff (Technische Hoschule, Darmstadt, West Germany), Rens Kessener (Technische Hogeschool, Eindhoven, Netherlands), and Malcolm Sabin (CAD Centre, Cambridge, England) Aug. 1982 11 p refs Presented at ACM-SIGGRAPH 82 Conf., Boston, 28 Jul. 1982 Submitted for publication
(Grants SRC-N2B-1R-0371; SRC-GR/A80341)
(MC-IW-202/82) Avail: NTIS HC A02/MF A01

During the recently concluded technical review of GKS, the input facilities became a bone of contention. The discussions revealed many inadequacies in the virtual input device concept, and were finally resolved using a refined and extended model of input, which is presented here by some of the participants in the discussions. Examples are included, showing how the GKS facilities derive from the model, and the Core's STROKE device is used to show how the model controls future extensions to GKS. The model is also used to described the other differences between the input facilities of the Core system and GKS. B.W.

**N83-18314#** Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Computer Science.
**A SURVEY OF A SYNCHRONOUS I/O TECHNIQUES FOR UNIX**
David S. H. Rosenthal Aug. 1982 18 p refs Submitted for publication
(Contract SRC-GR/A80341)
(MC-IW-203/82) Avail: NTIS HC A02/MF A01

The UNIX operating system's model of input/output (I/O) is fundamentally synchronous, that is, conceptually each process' computation and I/O are not overlapped. Although for the great bulk of applications this model is entirely adequate, certain applications find it irksome. The various techniques developed to overcome or avoid this restriction are described and contrasted, using example applications to illustrate the advantages and problems of each. Author

**N83-18315#** Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Computer Science.
**GKS IN C**
David S. H. Rosenthal and Paul J. W. tenHagen Aug. 1982 17 p refs Presented at EuroGraphics 82 Conf., Manchester, England, 9 Sep. 1982 Submitted for publication Sponsored by Netherlands Organ. for Applied Science TNO
(Grants SRC-GR/A80341; SRC-N2B-IR-0371)
(MC-IW-204/82) Avail: NTIS HC A02/MF A01

A binding of the graphical kernel system (GKS), the draft ISO standard for 2D graphics software, to the programming language C is presented, together with the principles underlying its design. The binding is compared with the binding of FORTRAN. An implementation of GKS according to this binding is also described, particular attention being paid to the techniques for segment storage, input, and workstations. The implementation is assessed against implementations in FORTRAN. Author

**N83-18316#** Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Computer Science.
**MANAGING GRAPHICAL RESOURCES**
David S. H. Rosenthal Aug. 1982 14 p refs Presented at ACM-SIGGRAPH Workshop on Graphics Input Interaction, Seattle, 2-4 Jun. 1982 Submitted for publication
(MC-IW-205/82) Avail: NTIS HC A02/MF A01

The development of interactive graphics software separated into two apparently incompatible streams (the mainstream, exemplified by Smalltalk and the Carnegie-Mellon CANVAS package) are discussed. The mainstream, the RasterOp stream, and the storage tube window manager are described in a common format. They are assessed against the goal of resource management. The design principles for a package based on resource management are presented. R.J.F.

**N83-18317#** Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Computer Science.
**HOARE'S LOGIC FOR PROGRAMMING LANGUAGES WITH TWO DATA TYPES**
J. A. Bergstra (Leiden Univ.) and J. V. Tucker (Leeds Univ., England) Sep. 1982 16 p refs Submitted for publication
(MC-IW-207/82) Avail: NTIS HC A02/MF A01

The completeness of Hoare's logic is considered with a first order assertion language applied to while-programs containing variables of two (or more) distinct types. While Cook's completeness theorem generalities to many sorted interpretations certain fundamentally important structures turn out not to be expressive. The case of programs with distinguished counter variables and boolean variables adjoined is studied; for example, it is shown that adding counters to arithmetic destroys expressiveness. J.M.S.

**N83-18318#** Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Computer Science.
**PROCESSES AND THE DENOTATIONAL SEMANTICS OF CONCURRENCY**
J. W. deBakker and J. I. Zucker (New York State Univ., Buffalo) Sep. 1982 62 p refs Submitted for publication
(MC-IW-209/82) Avail: NTIS HC A04/MF A01

A framework allowing a unified and rigorous definition of the semantics of concurrency is proposed. The mathematical model introduces processes as elements of process domains which are obtained as solutions of domain equations in the sense of Scott and Plotkin. Techniques of metric topology as proposed, e.g., by Navat are used to solve such equations. Processes are then used as meanings of statements in languages with concurrency. Three main concepts are treated, viz. parallellism - arbitrary interleaving of sequences of elementary actions, synchronization, and communication. These notions are embedded in languages which also feature classical sequential concepts such as assignment, tests, iteration or recursion, and guarded commands. In the definitions, a sequence of process domains of increasing complexity is used. The languages discussed include Milner's calculus for communicating systems and Hoare's communicating sequential processes. The paper concludes with a section with brief remarks on miscellaneous notions in concurrency, and two appendices with mathematical details. Author

**N83-18319#** Centre de Recherches Scientifiques et Techniques de l'Industrie des Fabrications Metalliques, Brussels (Belgium). Section: Machinebouw.
**THE COMPUTER AIDED DESIGN AND COMPUTER AIDED MANUFACTURING OF CAMS**
Jan deFraine Nov. 1982 173 p refs Sponsored by Inst. pour l'Encouragement de la Recherche Scientifique dans l'Industrieet l'Agriculture
(CRIF-MC-75) Avail: NTIS HC A08/MF A01

Trigonometric laws, polynomials and sphines, and circles and straight lines are discussed. The cam/follower mechanical configuration is analyzed. Computer program organization, geometric processing, formatting, and case studies are also discussed. Author

**N83-18320#** Maryland Univ., College Park. Computer Vision Lab.

**PARALLEL ALGORITHMS FOR IMAGE ANALYSIS**

Azriel Rosenfeld Jun. 1982 23 p refs

(Grant AF-AFOSR-3271-77; AF Proj. 2304)

(AD-A121292; AFOSR-82-0945TR) Avail: NTIS HC A02/MF A01 CSCL 09/2

This paper surveys the types of algorithms that are used in image processing and analysis, at both the pixel level and the region level, and discusses how such algorithms might be implemented in parallel using various types of cellular architectures. Author (GRA)

**N83-18321#** Naval Postgraduate School, Monterey, Calif. Dept. of Computer Science.

**SIMPLE METRICS FOR PROGRAMMING LANGUAGES**

Bruce J. MacLennan Oct. 1982 32 p refs

(Contract N00014-82-WR-20162; RR0000110)

(AD-A121282; NPS52-82-010) Avail: NTIS HC A03/MF A01 CSCL 09/2

Several metrics for guiding the design and evaluation of programming languages are introduced. The objective is to formalize notions such as size, complexity, orthogonality, and simplicity. Three different kinds of metrics are describes: syntactic, semantic, and transformational. Syntactic metrics are based on the size of a context-free grammar for a language or a part of a language. They can be used to judge the size of a language and the relative sizes of its parts. These techniques are demonstrated by their application to PASCAL, ALGOL-60, and ADA. Syntactic metrics make no reference to the meaning of a language's constructs. For this purpose we have developed several semantic metrics that measure the interdependencies among the basic semantic ideas in a language. This technique has been applied to the control, data, and name structures of FORTRAN, BASIC, LISP, ALGOL-60, and PASCAL. Finally, we suggest that a useful measure of a programming language is the complexity of the relationship between its syntactic and semantic structures. For this purpose we introduce a transformational metric and demonstrate its use on subsystems of several languages. GRA

**N83-18322#** Naval Research Lab., Washington, D. C. Computer Science and Systems Branch.

**THE A-7E SOFTWARE REQUIREMENTS DOCUMENT: THREE YEARS OF CHANGE DATA**

L. J. Chmura and D. M. Weiss 8 Nov. 1982 24 p refs

(RR0140941)

(AD-A121602; AD-E000506; NRL-MR-4938) Avail: NTIS HC A02/MF A01 CSCL 09/2

A major product of the Naval Research Laboratory's Software Cost Reduction project is the software requirements document for the Navy's A-7E aircraft operational flight program. The document, which was first published in November 1978, is intended to serve as a model for specifying complex software systems. We have monitored all changes to the document. The change data have consistently suggested that the specification has several desirable qualities, for example, it is easily maintained and is remarkably free of inappropriate implementation detail. GRA

**N83-18323#** Massachusetts Inst. of Tech., Cambridge. Lab. for Computer Science.

**LAYOUTS FOR THE SHUFFLE-EXCHANGE GRAPH BASED ON THE COMPLEX PLANE DIAGRAM**

Frank Thomson Leighton, Margaret Lepley, and Gary L. Miller Jun. 1982 26 p refs

(Contract N00014-80-C-0622; Grant NSF MCS-80-07756)

(AD-A121596; MIT/LCS/TM-221) Avail: NTIS HC A03/MF A01 CSCL 09/2

The shuffle-exchange graph is one of the best structures known for parallel computation. Among other things, a shuffle-exchange computer can be used to compute discrete Fourier transforms, multiply matrices, evaluate polynomials, perform permutations and sort lists. The algorithms needed for these operations are extremely simple and many require no more than logarithmic time and constant space per processor. In this paper, we analyze the algebraic structure of the shuffle-exchange graph in order to find area-efficient embeddings of the graph in a two-dimensional grid. The results are applicable to the design of very large Scale Integration (VLSI) circuit layouts for a shuffle-exchange computer. GRA

**N83-18324#** Massachusetts Inst. of Tech., Cambridge. Lab. for Computer Science.

**AUTOMATIC SYNTHESIS OF IMPLEMENTATIONS FOR ABSTRACT DATA TYPES FROM ALGEBRAIC SPECIFICATIONS Ph.D. Thesis**

Mandayam Kannappan Srivas Jun. 1982 164 p refs

(Contract N00014-75-C-0661; Grant NSF MCS-78-01798)

(AD-A121520; MIT/LCS/TR-276) Avail: NTIS HC A08/MF A01 CSCL 09/2

This thesis explores an automatic method of synthesizing implementations for data types for their algebraic specifications. The inputs to the synthesis procedure consist of a specification for the implemented type, a specification for each of the implementing types, and a formal description of the representation scheme to be used by the implementation. The output of the procedure consists of an implementation for each of the operations of the implemented type in a simple applicative language. The inputs and the output of the synthesis procedure are precisely characterized. A formal basis for the method employed by the procedure is developed. The method is based on the principle of reversing the technique of proving the correctness of an implementation of a data type. The restrictions on the inputs, and the conditions under which the procedure synthesizes an implementation successfully are formally characterized. GRA

**N83-18325#** Massachusetts Inst. of Tech., Cambridge. Energy Lab.

**ASPEN TECHNICAL REFERENCE MANUAL**

May 1982 527 p refs

(Contract DE-AC21-81MC-16481)

(DE82-020201; DOE/MC-16481/1202-Vol-2) Avail: NTIS HC A23/MF A01

ASPEN (Advanced System for Process Engineering) is a software system for computer-aided process design. ASPEN was developed at M.I.T. during the period 1976-1981 under the sponsorship of the Department of Energy and 55 industrial participants. There are four manuals and one computer tape describing the maintenance, use, and installation of ASPEN. The ASPEN Technical Reference Manual is a two volume manual containing detailed technical descriptions of ASPEN unit operation models, physical property models, cost models, convergence methods, and the flowsheet analysis algorithm. It is intended solely as a reference manual for ASPEN support staff and advanced users. It is not necessary for the average user to have this manual in order to use ASPEN. DOE

**N83-18326#** Massachusetts Inst. of Tech., Cambridge. Energy Lab.

**ASPEN TECHNICAL REFERENCE MANUAL**

May 1982 530 p 2 Vol.

(Contract DE-AC21-81MC-16481)

(DE82-020200; DOE/MC-16481/1202-Vol-1) Avail: NTIS HC A23/MF A01

ASPEN (Advanced System for Process Engineering) is a software system for computer-aided process design. ASPEN was developed at M.I.T. during the period 1976-1981 under the sponsorship of the Department of Energy and 55 industrial participants. There are four manuals and one computer tape describing the maintenance, use, and installation of ASPEN. The ASPEN Technical Reference Manual is a two volume manual containing detailed technical descriptions of ASPEN unit operation models, physical property models, cost models, convergence methods, and the flowsheet analysis algorithm. It is intended solely as a reference manual for ASPEN support staff and advanced users. It is not necessary for the average user to have this manual in order to use ASPEN. DOE

**N83-18327#** Massachusetts Inst. of Tech., Cambridge. Energy Lab.
**ASPEN SYSTEM ADMINISTRATOR MANUAL**
May 1982 647 p 2 Vol.
(Contract DE-AC21-81MC-16481)
(DE82-202199; DOE/MC-16481/1201-Vol-2) Avail: NTIS HC A99/MF A01

Advanced System for Process Engineering (ASPEN) is a software system for computer aided process design. System maintenance and updating procedures and documentation of the ASPEN program code are given. The manual is intended to serve as a reference manual and a maintenance manual for ASPEN support staff and as a programmer's guide for anyone writing a new model. DOE

**N83-18328#** Massachusetts Inst. of Tech., Cambridge. Energy Lab.
**ASPEN SYSTEM ADMINISTRATOR MANUAL**
May 1982 729 p ref 2 Vol.
(Contract DE-AC21-81MC-16481)
(DE82-020198; DOE/MC-16481/1201-Vol-1) Avail: NTIS HC A99/MF A01

Advanced System for Process Engineering (ASPEN) is a software system for computer aided process design. System maintenance and updating procedures and documentation of the ASPEN program code are given. The System Administrator Manual is intended to serve as a reference manual and a maintenance manual for ASPEN support staff and as a programmer's guide for anyone writing a new model. DOE

**N83-18329#** Massachusetts Inst. of Tech., Cambridge. Energy Lab.
**ASPEN USER MANUAL**
May 1982 720 p 2 Vol.
(Contract DE-AC21-81MC-16481)
(DE82-020196; DOE/MC-16481/1203-Vol-1) Avail: NTIS HC A99/MF A01

Advanced System for Process Engineering (ASPEN) is a software system for computer aided process design. The ASPEN User Manual is a two volume manual describing how to use ASPEN. It is intended to serve both as a reference manual for users familiar with ASPEN and as a tutorial manual for the beginning user. The User Manual contains all the information needed to create an ASPEN file. It does not describe how to make an ASPEN run. Additional manuals and publications are discussed. DOE

**N83-18330#** California Univ., Livermore. Lawrence Livermore Lab.
**PROTOTYPING AND THE LIFE CYCLE OF SOFTWARE SYSTEMS**
Meera Blattner and Richard Frobose 1981 12 p refs Presented at the 2nd Assoc. for Computing Machinery Software Eng. Symp., Columbia, Md., 19-21 Apr. 1982
(Contract W-7405-eng-48)
(DE82-001622; UCRL-86789; CONF-820404-1) Avail: NTIS HC A02/MF A01

It is argued that prototyping is an integral part of the creative process and thus should be incorporated into software design methodologies. Prototyping in software development is developed and defined. An example of a large software system at Lawrence Livermore, AUTOLOG, that was developed through prototyping is given. DOE

**N83-18331#** Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.
**PERFORMANCE OF THE THERMODYNAMIC PROPERTIES MODELS IN ASPEN**
L. W. Fish and D. R. Evans 1982 15 p refs Presented at the AICHE Natl. Winter Meeting, Orlando, Fla., 28 Feb. - 3 Mar. 1982
(Contract DE-AC07-76ID-001570)
(DE82-008612; EGG-M-00782; CONF-820202-12) Avail: NTIS HC A02/MF A01

In the course of performing a number of analyses using ASPEN, the performance of the ASPEN models for computing thermodynamic properties was observed. Pure-component properties for propane, isobutane, Freon 12, and Freon 22 and mixture properties for the propane-isobutane and the ethanol-water systems were computed and the results compared with available data sources and with independent sources of computed properties. The built-in data regression system of ASPEN was used to regress P-V-T and enthalpy departure data for isobutane to determine model-specific parameters. The extended Antoine vapor pressure parameters were calculated for Freon 12. The ethanol-water vapor-liquid equilibrium region was studied throughout the composition range for three isobaric data sets. Several activity coefficient models in ASPEN were fit to the data using various user-specified property routes. DOE

**N83-18332#** Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Dynamics Div.
**DIGITAL IMAGE PROCESSING**
P. Haberaecker 1982 58 p refs Presented at Summer School Lecture on Remote Sensing in Marine Sci. and Technol., Dundee, Scotland, 1-21 Aug. 1982
(MBB-UA-647-82-O; MBB-TN-AE-334-3/82) Avail: Issuing Activity

Techniques applied in digital image processing and pattern recognition are reviewed. Digitization of pictorial information is explained with black and white, grey tone and color images. Mathematical models of digitized images are given and generalized to a model of multichannel time sequences of images. Data structures and techniques of data reduction and compression are explained. Hardware and software aspects of a general purpose image processing system are discussed. Software and image data structures should be highly flexible and modular. The theoretical background of the orthonormal expansion of two-dimensional functions is given. Geometrical transformations of digital images are discussed, starting with enlargement and reduction. Scene analysis and segmentation techniques, e.g., thresholding, multivariate classification, contour following, and region growing are explained. Image understanding and interpretation are treated. Author (ESA)

**N83-18333#** Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Unternehmensbereich Apparate.
**AN APPROACH TO A PORTABLE PASCAL LANGUAGE FOR DIFFERENT ONBOARD COMPUTER SYSTEMS**
S. Reitz and W. Wiemer 1982 12 p refs
(MBB-AE-13-UA-648-82-O-E) Avail: Issuing Activity

Programs, written in PASCAL, including vertical (different host computers) and horizontal (different target processors) portability, were developed and tested in order to improve and optimize software development for microprocessors. To run the programs on the target microprocessors the generated intermediate code was converted into a specific code. The P4-code compiler written in PASCAL was chosen, so that extensions can be easily inserted. The programming system is divided into five parts: extended P4-compiler, P4-code linkage, optimizations and table-driven code generators, target system simulator, target operating system. The code generator consists of one package forming the table which is used as input for the table interpreter. Its output is the microprocessor code. Author (ESA)

**N83-17482#** Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
**AEROELASTIC EQUILIBRIUM OF AN HELICOPTER ROTOR WITH NONLINEAR AERODYNAMIC FORCES**
Jean-Joel Costes *In* AGARD Prediction of Aerodyn. Loads on Rotorcraft Sep. 1982 21 p refs In FRENCH; ENGLISH summary (For primary document see N83-17470 08-01)
Avail: NTIS HC A14/MF A01

**N83-17483#** Costruzioni Aeronautiche Giovanni Agusta S.p.A., Varese (Italy). Dynamics Engineering Dept.
**FIRST RESULTS FOR THE DEFINITION OF A GENERAL ROTORCRAFT DYNAMIC PROGRAM**

Anselmo Russo and Alberto Ceriotti *In* AGARD Prediction of Aerodyn. Loads on Rotorcraft Sep. 1982 14 p refs (For primary document see N83-17470 08-01)
Avail: NTIS HC A14/MF A01

**N83-17485#** Army Research and Technology Labs., Moffett Field, Calif.
**THE DEVELOPMENT OF A SYSTEM FOR INTERDISCIPLINARY ANALYSIS OF ROTORCRAFT FLIGHT CHARACTERISTICS**
Andrew W. Kerr and Wendell B. Stephens (Army Aeromechanics Labs.) *In* AGARD Prediction of Aerodyn. Loads on Rotorcraft Sep. 1982 14 p refs (For primary document see N83-17470 08-01)
Avail: NTIS HC A14/MF A01

**N83-17489#** Army Research and Technology Labs., Fort Eustis, Va. Applied Technology Lab.
**DATAMAP AND ITS IMPACT ON PREDICTION PROGRAMS**
Donald J. Merkley and Arthur E. Ragosta *In* AGARD Prediction of Aerodyn. Loads on Rotorcraft Sep. 1982 13 p refs (For primary document see N83-17470 08-01)
Avail: NTIS HC A14/MF A01

# 62 COMPUTER SYSTEMS

Includes computer networks.

**N83-18334#** Royal Inst. of Tech., Stockholm (Sweden). Dept. of Numerical Analysis and Computing Science.
**INFORMATION PROCESSING IN A NETWORK OF MODEL NEUTRONS: A COMPUTER SIMULATION STUDY**
Anders Lansner 1982 41 p refs
(TRITA-NA-8211) Avail: NTIS HC A03/MF A01

An interactive computer simulation package intended for the simulation of neuronal network activity is described. The networks simulated are comprised of excitatory and inhibitory model neurons connected with each other via conventional chemical synapses. The model neurons were designed to be as biologically realistic as possible within the limits imposed by the computational capacity of an ordinary mainframe computer. The package allows interactive manipulation of network configuration and system parameters and it includes routines for display of results on a graphic terminal or plotter. The biological relevance of the information processing principles suggested by the so called cell assembly theory is discussed. Some simulation results using a simplified model of the mammalian cerebral cortex are reported and discussed. The formation of subsets of neurons (cell assemblies), that serve as internal representations of different stimulus patterns could be simulated. S.L.

**N83-18335#** Calspan Field Services, Inc., Arnold Air Force Station, Tenn.
**EXPERIMENTAL INVESTIGATION OF DISCRETE HEAT TRANSFER MEASUREMENT TECHNIQUES FOR TUNNEL A APPLICATIONS Final Report, Oct. 1979 - Oct. 1980**
G. Wannenwetsch AEDC Jul. 1981 31 p refs Sponsored by AEDC
(AD-A113251; AEDC-TSR-81-V23) Avail: NTIS HC A03/MF A01 CSCL 14/2

Experimental heat transfer tests were conducted to evaluate several testing and data reduction techniques that had potential for improving the quality of heat transfer data obtained, in Tunnel A. The wedge used in this investigation was instrumented with several types of heat gages and two thin-skin sections. Data were gathered in an interference flow field by mounting a disturbance generator on the surface of the wedge. Tests were conducted at Mach 3 and free-stream Reynolds number of 3.8 x 10 to the 6th power/ft. Wedge angles varied from 0 to 25 degrees. GRA

**N83-18336#** California Univ., Berkeley. Lawrence Berkeley Lab. Dept. of Computer Science and Mathematics.
**PROCEEDINGS OF THE 6TH BERKELEY WORKSHOP ON DISTRIBUTED DATA MANAGEMENT AND COMPUTER NETWORKS**
1982 391 p refs Workshop held in Pacific Grove, Calif., 16 Feb. 1982
(Contract W-7405-eng-48)
(DE82-007917; LBL-13452; CONF-820201) Avail: NTIS HC A17/MF A01

Data management, data transfer, protocols, and architecture of distributed data bases and computer networks are addressed. DOE

# 63 CYBERNETICS

Includes feedback and control theory.
For related information see also *54 Man/System Technology and Life Support.*

**N83-18337*#** Old Dominion Univ., Norfolk, Va. Dept. of Electrical Engineering.
**DESIGN OF MULTIVARIABLE FEEDBACK CONTROL SYSTEMS VIA SPECTRAL ASSIGNMENT Progress Report, 1 Mar. - 30 Sep. 1982**
Roland R. Mielke, Leonard J. Tung, and Mohsen Marefat Jan. 1983 112 p refs
(Grant NsG-1650)
(NASA-CR-169889; NAS 1.26:169889) Avail: NTIS HC A06/MF A01 CSCL 09B

The applicability of spectral assignment techniques to the design of multivariable feedback control systems was investigated. A fractional representation design procedure for unstable plants is presented and illustrated with an example. A computer aided design software package implementing eigenvalue/eigenvector design procedures is described. A design example which illustrates the use of the program is explained. Author

**N83-18338#** Helsinki Univ. of Technology, Espoo (Finland). Systems Theory Lab.
**TWO-LEVEL SOLUTION METHODS FOR CONSTRAINED OPTIMAL CONTROL PROBLEMS Ph.D. Thesis**
Juhani Hirvonent May 1982 12 p refs Sponsored by Finnish Cultural Foundation, Emil Aaltonen Foundation, Foundation of Technology and Walter Ahlstroem Foundation
(Rept-A-2; ISBN-951-752-574-5; ISSN-0355-7030) Avail: NTIS HC A02/MF A01

Computational methods for solving constrained optimization problems are discussed. Multiplier and two-level methods are presented, with special attention given to state space constrained optimal control problems. L.D.M.

**N83-18339#** Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Operations Research.
**INVERTIBILITY OF AFFINE NONLINEAR CONTROL SYSTEMS: A GEOMETRIC APPROACH**
Henk Nijmeijer Jun. 1982 15 p refs Submitted for publication Sponsored by CNR
(MC-BW-162/82) Avail: NTIS HC A02/MF A01

The paper deals with the invertibility of multivariable nonlinear control systems. By using the recently developed theory on controlled invariant and controllability distributions necessary and sufficient conditions for invertibility are derived. Author

**N83-18340#** Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Operations Research.
**THE DISTURBANCE DECOUPLING PROBLEM FOR NONLINEAR CONTROL SYSTEMS**
Henk Nijmeijer and Arjan J. vanderSchaft (Groningen Univ., Neth.) Mar. 1982 12 p refs Submitted for publication
(MC-BW-157/82) Avail: NTIS HC A02/MF A01

Necessary and sufficient conditions are derived for the solution of the disturbance decoupling problem for general nonlinear control systems. Some conceptual algorithms needed are discussed. Author

**N83-18341#** Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Operations Research.
**A DIFFERENTIAL GEOMETRIC APPROACH TO OPTIMAL CONTROL**
J. C. P. Bus Jun. 1982 37 p refs Submitted for publication
(MC-BW-161/82) Avail: NTIS HC A03/MF A01

A general formalism is introduced for the optimal control problem on manifolds. It is based on a general formulation of Lagrange's multiplier theorem and recent definitions of nonlinear control systems. Pontryagin's maximum principle is used in this formalism. The problem formulation given in this paper is particularly suitable for application of modern results about controllability, etc., in nonlinear control systems. B.W.

**N83-18342#** Technische Hogeschool, Delft (Netherlands). Dept. of Mathematics and Informatics.
**OPTIMAL CONTROL OF DYNAMIC SYSTEMS**
C. deWit 1982 25 p refs
(PB82-251687; Rept-82-04) Avail: NTIS HC A02/MF A01 CSCL 12A

A brief treatment of optimal control theory is presented. Broad topics discussed include the following: controlled dynamic systems; the minimal time problem; and, the general optimal control problem. GRA

# 64 NUMERICAL ANALYSIS

Includes iteration, difference equations, and numerical approximation.

**N83-18343** Technische Universitaet, Munich (West Germany). Inst. fuer Mathematik.
**FOUNDATIONS OF K-THEORY FOR C*-ALGEBRAS**
J. Hilgert May 1982 64 p refs
(TUM-M8208) Copyright. Avail: Issuing Activity

A concise treatment of K-theory for C*-algebras is presented which follows and generalizes Karoubis' approach to K-theory for locally compact spaces. K-theory for unital and nonunital C*-algebras, excision theorems, K-theory as homotropy functor, suspensions and higher K-groups, Bott periodicity and the six term sequence, and multiplicative structures are covered. M.G.

**N83-18344** National Physical Lab., Teddington (England). Div. of Information Technology and Computing.
**NEWTON'S METHOD FOR SOLVING THE ALGEBRAIC RICCATI EQUATION**
S. J. Hammarling Sep. 1982 18 p refs
(NPL-DITC-12/82; ISSN-0262-5369) Copyright. Avail: Issuing Activity

The use of Newton's method to solve the algebraic Riccati equation Q + A(H)X + XA - XPX = O, where Q and P are non-negative definite is discussed. How Newton's method can be used to find the Cholesky factor of the non-negative definite solution X without first finding X is demonstrated. M.G.

**N83-18345** Technische Universitaet, Munich (West Germany). Inst. fuer Mathematik.
**THE MAYER VIETORIS AND THE PUPPE SEQUENCE IN K-THEORY FOR C*-ALGEBRAS**
J. Hilgert Apr. 1982 24 p refs
(TUM-M8206) Copyright. Avail: Issuing Activity

The existence of a Mayer Vietoris and a Puppe sequence in the K-theory for C*-algebras is shown. Both sequences generalize the respective sequence in the commutative case in the sense that they reduce to those sequences under the identification K sub alpha (C sub omicron(X)) = K(alpha)(X) if all involved algebras are chosen to be commutative, i.e., of he form C sub omicron (X) for a locally compact space X. The sequences are used to calculate the K-theory of certain bundle-C*-algebras with continuous identify field. M.G.

**N83-18346** Technische Universitaet, Munich (West Germany). Inst. fuer Mathematik.
**MAXIMAL SIMULTANEOUS CONTINUATIONS IN COMPLEX ANALYSIS**
Sandra Hayes Apr. 1982 30 p refs
(TUM-M8207) Copyright. Avail: Issuing Activity

Two fundamental problems in complex analysis are discussed which involve the maximal simultaneous continuation of holomorphic functions. The question of whether an envelope of holomorphy exists and, if so, does it have the property of being Stein is addressed. M.G.

**N83-18347** Technische Universitaet, Munich (West Germany). Inst. fuer Mathematik.
**A COVARIANT DESCRIPTION OF PARTICLE POSITION**
D. P. L. Castrigiano and M. Mutze May 1982 22 p refs
(TUM-M8209) Copyright. Avail: Issuing Activity

A manifest Poincare covariant description of particle position is achieved by extending the Wightman localization of the particle to the whole of space like hyperplanes of Minkowski space. Subsequently some related questions are briefly discussed. Author

**N83-18348#** Tata Inst. of Fundamental Research, Bombay (India).
**ON A THEOREM OF HORROCKS**
S. M. Bhatwadekar [1982] 13 p refs
Avail: NTIS HC A02/MF A01

Let R be a regular local ring of dimension d and let f be a regular parameter of R. When d = 3 and R contains a coefficient field then Horrocks has proved that every projective R sub f-module of rank 2 is free and therefore every projective R sub f-module is free. This result is generalized by showing every projective R sub f-module of rank d-l is free when R contains a coefficient field. Moreover when d = 3 the result of Horrocks is proved under the weaker assumption that R is unramified. L.F.M.

**N83-18349*#** Harvard Univ., Cambridge, Mass. Div. of Applied Sciences.
**ALGEBRAIC GEOMETRIC METHODS FOR THE STABILIZABILITY AND RELIABILITY OF MULTIVARIABLE AND OF MULTIMODE SYSTEMS**
B. D. O. Anderson, R. W. Brockett, C. I. Byrnes, B. K. Ghosh, and P. K. Stevens Feb. 1983 288 p refs
(Grant NsG-2265)
(NASA-CR-166441; NAS 1.26:166441) Avail: NTIS HC A13/MF A01 CSCL 12A

The extent to which feedback can alter the dynamic characteristics (e.g., instability, oscillations) of a control system, possibly operating in one or more modes (e.g., failure versus nonfailure of one or more components) is examined. Author

**N83-18350#** Royal Inst. of Tech., Stockholm (Sweden). Dept. of Numerical Analysis and Computing Science.
**PARTITIONING A STIFF ORDINARY DIFFERENTIAL SYSTEM BY A SCALING TECHNIQUE**
Mao Zu-fan 1982 18 p refs
(TRITA-NA-8210) Avail: NTIS HC A02/MF A01

A stiff ordinary differential system in the partitioned form dx/dt=f(t,x,y) and E dy/dt=g(t,x,y) is more suited for treatment by numerical integration methods. A numerical algorithm based on a scaling technique is presented. By this algorithm a stiff system in which the right-hand-side functions are sums of products of powers of the variables is reduced to the partitioned form when balance assumptions are properly made. A graph theory approach which can help to select balance terms is also described. M.G.

**N83-18351#** Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of operations Research.
**AN ALGOL 68 PACKAGE FOR THE SOLUTION OF SYSTEMS OF NONLINEAR EQUATIONS: USER'S MANUAL**
F. J. Burger and J. C. P. Bus Mar. 1982 61 p refs Submitted for publication
(MC-BW-155/82) Avail: NTIS HC A04/MF A01

A user manual for an ALGOL 68 package for the solution of

the system of nonlinear equations is provided. It presents software for systems with and without known analytical derivatives as well as for reduction of systems with linear functions or linear occurring variables. M.G.

**N83-18352#** Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Operations Research.
**OBSERVABILITY OF AUTONOMOUS DISCRETE TIME NONLINEAR SYSTEMS: A GEOMETRIC APPROACH**
Henk Nijmeijer May 1982 15 p refs Submitted for publication
(MC-BW-160/82) Avail: NTIS HC A02/MF A01

In this paper observability of autonomous discrete time systems is studied from a purely differential geometric point of view. Similarly af for continuous time systems this approach leads to a local canonical form for an observable system. A proposal for the generalization of an invariant subspace is made. Author

**N83-18353#** Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Numerical Mathematics.
**ONE-DIMENSIONAL GALERKIN METHODS AND SUPERCONVERGENCE AT INTERIOR NODAL POINTS**
M. Bakker May 1982 16 p refs Submitted for publication
(MC-NW-126/82) Avail: NTIS HC A02/MF A01

A minor kind of superconvergence at specific points inside the segments of the partition is discussed for two classes of Galerkin methods: the Ritz-Galerkin method for 2m-th order self-adjoint boundary problems and the collection method for arbitrary m-th order boundary problems. These interior points are the zeros of the Jacobi polynomial P(m,m)sub n (sigma) shifted to the segments of the partition; n = k+1 - 2m, where k is the degree of the finite element space. The order of convergence at these points is k+2, one order better than the optimal order of convergence. Also, it can be proved that the derivative of the finite element solution is superconvergent of O(h(k+1)) at the zeros of the Jacobi polynomial P(m-1,m-1) sub n+1(sigma) shifted to the segments of the partition. This is one order better than the optimal order of convergence for the derivative. M.G.

**N83-18354#** Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Numerical Mathematics.
**A FOURTH ORDER ADI METHOD FOR SEMIDISCRETE PARABOLIC EQUATIONS**
P. J. vanderHouwen and H. B. deVries May 1982 43 p refs Submittted for publication
(MC-NW-128/82) Avail: NTIS HC A03/MF A01

A fourth order fourstep ADI method is decribed for solving the systems of ordinary differential equations which are obtained when a (nonlinear) parabolic initial boundary value problem in two dimensions is semidiscretized. The local time discretization error and the stability conditions are derived. By numerical experiments it is demonstrated that the (asymptotic) fourth order behavior does not degenerate if the time step increases to relatively large values. Also a comparison is made with the classical ADI method of Peaceman and Rachford showing the superiority of the fourth order method in the higher accuracy region, particularly in nonlinear problems. Author

**N83-18355#** Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Numerical Mathematics.
**ON THE COMPARISON OF LINE-GAUSS-SEIDEL AND INCOMPLETE LU (ILU) RELAXATION IN MULTIGRID ALGORITHMS**
P. W. Hemker Jun. 1982 12 p refs Submitted for publication
(MC-NW-129/82) Avail: NTIS HC A02/MF A01

The efficiency of Symmetric- and ZEBRA line-Gauss Seidel relaxation and Incomplete LU-factorization relaxation in multigrid algorithms are compared. To this end convergence rates are computed and an operations count was made for general regular 7-point discrete operators. As model problems for the numerical computation of the convergence rate the anisotropic diffusion and the convection diffusion equations are used. ESA

**N83-18356#** Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Numerical Mathematics.
**ESTIMATING THE GLOBAL ERROR OF RUNGE-KUTTA APPROXIMATIONS**
K. Dekker and J. G. Verwer Jun. 1982 26 p refs In NEPALI Submitted for publication
(MC-NW-130/82) Avail: NTIS HC A03/MF A01

The user of a code for solving the initial value problem for ordinary differential systems is normally left with the difficult task of assessing the accuracy of the numerical result returned by the code. Even when the code reports an estimate of the global error, the question may remain whether this estimate is correct, i.e., whether the user can rely on the estimate. This paper proposes a simple idea of measuring the reliability of the global error estimate with the aim of assisting the user in the validation of the numerical result. The idea is put into practice with the existing code GERK (ACM Algorithm 504) developed by Shampine and Watts. Author

**N83-18357#** Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Numerical Mathematics.
**REDUCIBILITY OF ALGEBRAICALLY STABLE GENERAL LINEAR METHODS**
K. Dekker Aug. 1982 16 p refs Submitted for publication
(MC-NW-131/82) Avail: NTIS HC A02/MF A01

An equivalence relation on the class of general linear methods is defined and it is shown that the property of algebraic stability is invariant for this relation. Methods which are algebraically stable for a singular matrix G turn out to be reducible. On the other hand, algebraically stable reducible methods are algebraically stable for a singular G. Each algebraically stable irreducible method is shown to be equivalent with a method which is stable for the identity matrix. Author

**N83-18358#** Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Numerical Mathematics.
**DEFECT CORRECTION FOR THE SOLUTION OF A SINGULAR PERTURBATION PROBLEM**
P. W. Hemker and P. M. deZeeuw Aug. 1982 9 p refs Submitted for publication
(HC-NW-132/82) Avail: NTIS HC A02/MF A01

A method is described for the accurate discretization of a differential equation in which the highest derivative is multiplied by a small parameter. It is well known that for such singular perturbation problems with a strongly asymmetric differential operator almost all discretizations are either unstable or inaccurate or direction dependent. By the combination, in an iterative process, of an inaccurate stable and an accurate unstable scheme we obtain an accurate stable solution, without adapting the scheme to the flow direction. Two approximate solutions are obtained that are both accurate in the smooth part of the solution. The difference between both solutions can be used for the detection of the unsmooth parts. Author

**N83-18359#** Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Numerical Mathematics.
**NUMERICAL ASPECTS OF SINGULAR PERTURBATION PROBLEMS**
P. W. Hemker Aug. 1982 24 p refs Submitted for publication
(MC-NW-133/82) Avail: NTIS HC A02/MF A01

A survey is given of the main problems that are encountered when singular perturbation problems are solved by numerical means. Some areas of research are indicated. For a two dimensional model problem an error estimate is given for the Hughes and Brooks Streamline-Upwind Petrov-Galerkin method. Author

**N83-18360#** Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Numerical Mathematics.
**LINEAR MULTISTEP METHODS FOR VOLTERRA INTEGRAL EQUATIONS OF THE SECOND KIND**
P. J. vanderHouwen and H. J. J. teRiele Aug. 1982 18 p refs Submitted for publication
(MC-NW-134/82) Avail: NTIS HC A02/MF A01

A general class of linear multistep methods for second kind

Volterra integral equations which include the conventional direct quadrature methods is described. A convergence theorem is presented and stability is investigated with respect to the linear convolution equation. Examples are given of V sub o stable methods. The theory is illustrated by a few numerical examples.
Author

**N83-18361#** Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Numerical Mathematics.
**IMPROVED ABSOLUTE STABILITY OF PREDICTOR-CORRECTOR METHODS FOR RETARDED DIFFERENTIAL EQUATIONS**
P. J. vanderHouwen and B. P. Sommeijer Aug. 1982 15 p refs Submitted for publication
(MC-NW-135/82) Avail: NTIS HC A02/MF A01

The absolute stability of predictor-corrector type methods is investigated for retarded differential equations. The stability test equation is of the form dy(t)/dt = omega sub 1 y(t) + omega sub 2 y (t-omega) where omega sub 1, omega sub 2 and omega are constants (omega >0). By generalizing the conventional predictor-corrector methods it is possible to improve the stability region in the (omega sub 1 delta t, omega sub 2 delta t) - plane considerably. In particular, methods based on extrapolation predictors and backward differentiation correctors are studied.
M.G.

**N83-18362#** Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Numerical Mathematics.
**THE TWO-LEVEL ALGORITHM IN THE SOLUTION OF THE INITIAL VALUE PROBLEM FOR PARTIAL DIFFERENTIAL EQUATIONS**
H. B. deVries Sep. 1982 40 p refs
(MC-NW-136/82) Avail: NTIS HC A03/MF A01

An implicit linear multistep method is applied to semi-discretized (nonlinear) time-dependent partial differential equations. Using Newton iteration the nonlinear implicit relations are replaced by a sequence of linear equations. These linear equations are solved by the iterative use of low-level algorithm. An iteration method based on incomplete LU-decomposition is chosen as the relaxation method (smoothing operator) in the two-level algorithm. Using discrete Fourier analysis the convergence and smoothing properties of the relaxation method are investigated for a model problem. The numerical experiments illustrate the choice of some suitable operators and parameters in the two-level algorithm. M.G.

**N83-18363#** Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Computer Science.
**FIXED POINT SEMANTICS IN PROCESS ALGEBRAS**
J. A. Bergstra (Leiden Univ.) and J. W. Klop Aug. 1982 24 p refs Submitted for publication
(MC-IW-206/82) Avail: NTIS HC A02/MF A01

Nondeterministic uniform processes as introduced by de Bakker and Zucker, with composition, union, merge, mu-operator, and semantics in metric spaces are considered. A collection of such processes are represented as the projective limit of collections of finite processes. Here a finite process is generated from a set of atomic actions by means of the operations sequential composition and nondeterministic union. The process algebra thus obtained is augmented by an operation "left merge' in terms of which the usual merge operator is defined. The existence of solutions of equations x = s(x), where s(x) is a mu-free expression, is shown. This yields the existence of a fixed point semantics for process expressions containing the mu-operator. The proof amounts to a combinatorial analysis showing that certain iteration sequences stabilize on each finite level. M.G.

**N83-18364#** Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Mathematical Statistics.
**A BOUND ON THE SIZE OF POINT CLUSTERS OF A RANDOM WALK WITH STATIONARY INCREMENTS**
H. Berbee Apr. 1982 12 p refs
(MC-SW-82/82) Avail: NTIS HC A02/MF A01

Consider a random walk on R(d) with stationary, possibly dependent increments. Let N(V) count the number of visits to a bounded set V. Bounds are given on the size of N(t+V), uniformly in t, in terms of the behavior of N in a neighborhood of the origin.
M.G.

**N83-18365#** Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Mathematical Statistics.
**ANALYSIS OF ASSOCIATION OF CATEGORICAL VARIABLES BY NUMERICAL SCORES AND GRAPHICAL REPRESENTATION**
Nancy K. Kester and Bert F. Schriever Aug. 1982 36 p refs Submitted for publication
(MG-SW-85/82) Avail: NTIS HC A03/MF A01

An expository treatment of correspondence analysis (CA) and homogeneity analysis (HA), two data analytic techniques which describe association among categorical variables in terms of numerical scores assigned to the categories is presented. These scores are analogous to loadings of numerical variables on principal components. Thus CA and HA allow graphical representations of the data. Rules for interpretation of such representations are given and applied to a real data set. M.G.

**N83-18366#** Boeing Computer Services Co., Tukwila, Wash. Energy Technology Applications Div.
**ORDERING METHODS FOR SPARSE MATRICES Annual Report, 1 Jul. 1981 - 30 Jun. 1982**
William G. Poole, Jr. 20 Aug. 1982 9 p
(Contract F39620-81-C-0072)
(AD-A121306; AR-1; AFOSR-82-0932TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

Five tasks are defined: creation of a comprehensive test matrix collection, analysis of the Hellerman-Rarick P4 algorithm, production of a P4 code, production of a diagnostic code, and comparative analysis of several algorithms using the test matrices and the diagnostic code. Status reports on the five tasks are given, relevant reports and publications of project personnel are listed and related sparse matrix activities are discussed. Work is progressing well on the project. A very promising and stable variation of the Hellerman-Rarick algorithm has been found and will be tested in the next phase of the project. GRA

**N83-18367#** Florida State Univ., Tallahassee. Dept. of Statistics.
**DEGRADABLE SYSTEMS. A SURVEY OF MULTISTATE SYSTEM THEORY**
Emad El-Neweihi and Frank Proschan Aug. 1982 34 p refs
(Grant AF-AFOSR-0170-80; AF Proj. 2304)
(AD-A121186; AFOSR-82-0920TR; FSU-STATISTICS-M637; TR-82-150-AFOSR) Avail: NTIS HC A03/MF A01 CSCL 12/1

The vast majority of reliability analyses assume that components and system are in either of two states: functioning or failed. However, in many real life situations we are actually able to distinguish among various 'levels of performance' for both system and components. For such situations, the existing dichotomous model is a gross oversimplification and so models assuming degradable (multistate) systems and components are preferable since they are closer to reality. We present a survey of recent papers which treat the more sophisticated and more realistic models in which components and systems may assume many states ranging from perfect functioning to complete failure. Our survey updates and complements a previous survey by El-Neweihi and Proschan (1978). GRA

**N83-18368#** Brown Univ., Providence, R. I.
**DYNAMICS IN PARABOLIC EQUATIONS. AN EXAMPLE**
Jack K. Hale Aug. 1982 15 p refs
(Grant AF-AFOSR-0198-81; AF Proj. 2304)
(AD-A121230; AFOSR-82-0934TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

For a parabolic equation, results are given about the orbits which connect equilibrium points. The approach is based on the theory of dynamical systems and the maximum principle. GRA

**N83-18369#** Stanford Univ., Calif. Dept. of Computer Science.
**ADAPTIVE MESH REFINEMENT FOR HYPERBOLIC PARTIAL DIFFERENTIAL EQUATIONS Ph.D. Thesis**
Marsha J. Berger Aug. 1982 124 p refs
(Contract N00014-75-C-1132)
(AD-A121307; SU-STAN-CS-82-924) Avail: NTIS HC A06/MF A01 CSCL 12/1

In many time dependent simulations, the solution on most of the domain will be fairly smooth, with discontinuities or highly oscillatory phenomena occurring over only a small fraction of the domain. In problems such as these, a mesh refinement approach can be the most efficient, and often the only practical, solution method. Refined grids with smaller and smaller mesh spacing are placed only where they are needed. Since we are solving a time dependent problem, the regions needing refinement will change, and therefore our grids must adapt with time as well. This thesis presents a method based on the idea of multiple, component grids for the solution of hyperbolic partial differential equations(pde) using explicit finite difference techniques. Based upon Richardson-type estimates of the local truncation error, refined grids are created or existing ones removed to attain a given accuracy for a minimum amount of work. In addition, this approach is recursive in that fine grids can themselves contain even finer subgrids. Those grids with finer mesh width is space will also have a smaller mesh width in time, making this is a mesh refinement algorithm in time and space. GRA

**N83-18370#** Naval Surface Weapons Center, Dahlgren, Va. Space and Surface Systems Div.
**WEPOR: A WEIGHTED POLYNOMIAL REGRESSION PROGRAM Final Report**
Patricia A. Shields and Marlin A. Thomas Sep. 1982 34 p refs
(AD-A121610; NSWC/TR-82-49) Avail: NTIS HC A03/MF A01 CSCL 12/1

Two weighted least squares regression programs are documented and exemplified. Both programs apply to polynomial models with one independent variable. Program WEPOR was formulated for the case in which the error terms have different variances but are uncorrelated, whereas WEPOR2 deals with the problem of different variances and correlated error terms. Output from both programs include ANOVA (ANalysis Of VAriance) tables, predicted values of the dependent variable and the associated residuals, confidence and prediction limits for selected synthetic points, and a plot of the sample points, the regression curve, and the confidence and prediction limits. Author (GRA)

**N83-18371#** Naval Postgraduate School, Monterey, Calif. Dept. of Mathematics.
**PROPERTIES OF A MULTIVARIATE GOODNESS-OF-FIT TEST Interim Report for period ending 1982**
Toke Jayachandran, Richard Franke, and Richard Linhart Oct. 1982 22 p refs
(AD-A121519; NPS53-82-0001) Avail: NTIS HC A02/MF A01 CSCL 12/1

In an earlier paper the authors compared the Foutz test with the Chi-square and Kolmogorov-Smirnov test. The results indicated that the Foutz test is more powerful in detecting certain characteristics than the other two tests. This paper deals with the performance of the test when fitting multivariate distributions. More specifically the power of the test when fitting bivariate and trivariate normal distributions for various choices of the mean vector and the covariance matrix is investigated. In the second section is presented a brief description of the Foutz test; a discussion of the simulation procedure is in the third section and the results of the simulation are in the final section. GRA

**N83-18372#** California Univ., Livermore. Lawrence Livermore Lab.
**ADAPTIVE-GRID METHODS FOR TIME-DEPENDENT PARTIAL DIFFERENTIAL EQUATIONS**
G. W. Hedstrom and G. H. Rodrique 1981 12 p refs Presented at the Conf. on Multigrid Methods, Cologne, West Germany, 23-27 Nov. 1981 Submitted for publication
(Contract W-7405-eng-48)
(DE82-011155; UCRL-87242; CONF-811182-1) Avail: NTIS HC A02/MF A01

A survey of recent developments of adaptive grid algorithms for time dependent partial differential equations is presented. Two lines of research are discussed. One involves the automatic selection of moving grids to follow propagating waves. The other is based on stationary grids but uses local mesh refinement in both space and time. Advantages and disadvantages of both approaches are discussed. The development of adaptive grid schemes shows promise of greatly increasing our ability to solve problems in several spatial dimensions. DOE

**N83-18373#** California Univ., Livermore. Lawrence Livermore Lab.
**THE APPLICATION OF THE BOOTSTRAP ESTIMATOR TO TRANSIENT RESPONSE DATA**
Freddie Lenier Barnes 30 Dec. 1981 95 p refs
(Contract W-7405-eng-48)
(DE82-007576; UCRL-15429) Avail: NTIS HC A05/MF A01

For the purpose of obtaining a model or parameterization of a random process a non-standard algorithm is employed. The algorithm is considered non-standard since it uses state estimation and system identification algorithms in conjunction with each other. The bootstrap estimator (as the algorithm is called) is compared in performance with a standard identification algorithm (a Kalman filter reformulated for system identification). The comparison was necessary since in situation when the process to identified, as well as the measurement system, contains significant uncertainties (noise), some of the more standard algorithms (Kalman filter, Recursive least squares) yield totally erroneous results. Each algorithm was used to process two sets of data for the purpose of system identification. DOE

**N83-18374#** California Univ., Berkeley. Lawrence Berkeley Lab.
**CONCERNING TESTS OF TIME-REVERSAL INVARIANCE VIA THE POLARIZATION-ANALYZING POWER EQUALITY**
Homer E. Conzett Jan. 1982 16 p refs Presented at the 1st Intern. Conf. on Non-Potential Interactions and Their Lie-admissible Treatment, Orleans, France, 5-9 Jan. 1982
(Contract W-7405-eng-48)
(DE82-011017; LBL-13992; CONF-820136-1) Avail: NTIS HC A02/MF A01

Previous tests of time-reversal invariance via comparisons of polarizations and analyzing powers in nuclear scattering were examined. It was found that all of these comparisons fail as adequate tests of time-reversal invariance either because of a lack of experimental precision or the lack of sensitivity to any time-reversal symmetry violation. DOE

**N83-18375#** Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Operations Research.
**GENERALIZATIONS OF THE POLYMATROIDAL NETWORK FLOW MODEL**
E. L. Lawler (California Univ., Berkeley) Apr. 1982 21 p refs Submitted for publication
(Grant NSF MCS-78-20054)
(MC-BW-158/82) Avail: NTIS HC A02/MF A01

A polymatroidal network flow model is generalized to permit capacity constraints and lower bound constraints to be specified by intersecting families of subsets of arcs. It is shown how this generalization of the model can be used to obtain a particularly simple proof of the discrete separation theorem of Frank. A procedure is described for obtaining a feasible flow in a network with intersecting families of capacity constraints and lower bound constraints provided these constraints are in a relation of compliance. It is shown how the Edmonds-Giles problem can be formulated as a minimum cost circulation problem and how, with a single maximal flow computation, a feasible solution to the Edmonds-Giles problem can be determined. M.G.

**N83-18376#** Technische Hogeschool, Delft (Netherlands). Dept. of Mathematics and Informatics.

**A ROBUST AND EFFICIENT MULTIGRID METHOD**
P. Wesseling 1982 25 p refs
(PB82-251695; Rept-82-05) Avail: NTIS HC A02/MF A01 CSCL 12A

A multigrid method is described for an arbitrary elliptic partial differential equation with continuous coefficients on a rectangular region. The method is perceived by the user just as any other solver of linear algebraic systems. The user has to specify the matrix and right-hand-side only and does not need to be familiar with multigrid methods. The main ingredients of the method are the use of incomplete LU-decomposition for smoothing, Galerkin coarse-grid approximation, 7-point prolongation and restriction, and a fixed multigrid strategy. Application to various test-problems shows the method to be efficient and robust. Its efficiency is compared with the efficiency of other multigrid methods. GRA

**N83-18377#** Technische Hogeschool, Delft (Netherlands). Dept. of Mathematics and Informatics.
**SLOW APPROXIMATION WITH CONVOLUTION OPERATORS**
P. C. Sikkema 1981 16 p refs
(PB82-251810; Rept-81-04) Avail: NTIS HC A02/MF A01 CSCL 12A

It is proved that the class B of functions beta with which the convolution operators (U sub rho) are constructed contains elements such that if f belongs to a certain class M and if (f double prime) (x) exists, the rate of approximation of f(x) by ((U sub rho)f) (rho approaches infinity) is very small. GRA

**N83-18378#** Technische Hogeschool, Delft (Netherlands). Dept. of Mathematics and Informatics.
**NUMERICAL SOLUTION OF THE NAVIER STOKES EQUATIONS BY MEANS OF THE FINITE ELEMENT METHOD, PART 1**
A. Segal 1981 51 p refs
(PB82-251653; Rept-81-19-Pt-1) Avail: NTIS HC A04/MF A01 CSCL 12A

An extended survey is given of methods for discretizing the continuity equation in the case of the stationary (Navier) Stokes equations. Of each method, advantages and disadvantages are given. The discussion is limited to isothermal laminar flow. GRA

# 65 STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

**N83-18379*#** George Washington Univ., Washington, D.C. Inst. for Management Science and Engineering.
**A POISSON PROCESS APPROXIMATION FOR GENERALIZED K-5 CONFIDENCE REGIONS**
Hossein Arsham and Douglas R. Miller 19 Nov. 1982 43 p refs (Grant NAG1-179)
(NASA-CR-169862; NAS 1.26:169862) Avail: NTIS HC A03/MF A01 CSCL 12A

One-sided confidence regions for continuous cumulative distribution functions are constructed using empirical cumulative distribution functions and the generalized Kolmogorov-Smirnov distance. The band width of such regions becomes narrower in the right or left tail of the distribution. To avoid tedious computation of confidence levels and critical values, an approximation based on the Poisson process is introduced. This aproximation provides a conservative confidence region; moreover, the approximation error decreases monotonically to 0 as sample size increases. Critical values necessary for implementation are given. Applications are made to the areas of risk analysis, investment modeling, reliability assessment, and analysis of fault tolerant systems. M.G.

**N83-18380#** Hochschule der Bundeswehr, Neubiberg (West Germany). Forschungsschwerpunkt Simulation und Optimierung Deterministischer und Stochastischer Dynamischer Systeme.
**COMPUTATIONS OF DESCENT DIRECTIONS IN STOCHASTIC OPTIMIZATION PROBLEMS WITH INVARIANT DISTRIBUTIONS**
K. Marti Sep. 1982 60 p refs
Avail: NTIS HC A04/MF A01

One of the main problems in stochastic optimization is the minimization of mean value functions F(x)=Eu(A(omega)x-b (omega)) s.t. x is a member of D, where (A(omega),b(omega)) is a random matrix, u is a loss function on R(m) and D is a convex subset of R(n). If the distribution mu of (A(omega),b(omega)) is invariant with respect to an affine transformation lambda of R(n)(m+1), i.e., if lambda(mu)=mu, and if for a given R(n) there exists a vector y=y(x) such that lambda(A,b)(sup x sub-1)=Ay-b a.s., then F(y)=F(x) and, consequently, d=y-x is a descent direction of F at x, provided that F is not constant on the line segment joining x and y. For many practically important distributions mu the affine transformation lambda, a vextor y(x) and therefore also a direction of decrease d=y(x)-x is constructed without using any derivatives of F. Author

**N83-18381#** Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Operations Research.
**THE STRONG FINITE STOCHASTIC REALIZATION PROBLEM: PRELIMINARY RESULTS**
J. H. vanSchuppen Aug. 1982 18 p refs Submitted for publication
(MC-BW-164/82) Avail: NTIS HC A02/MF A01

The strong finite stochastic realization problem is given a probability space and a finite valued stochastic process, to show existence of and to classify all strong stochastic realizations of the given process that have a finite state space. The static version of this problem is investigated. Results are given on the classification of finite sigma-algebra's that make given finite sigma-algebra's minimal conditional independent. M.G.

**N83-18382#** Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Mathematical Statistics.
**SCALING OF ORDER DEPENDENT CATEGORICAL VARIABLES WITH CORRESPONDENCE ANALYSIS**
B. F. Schriever Apr. 1982 27 p refs Submitted for publication
(MC-SW-83/82) Avail: NTIS HC A03/MF A01

Forms of dependence between categorical variables are introduced which induce successively stronger orderings over the categories of the variables. It is proved that if these forms of dependence are present in contingency tables, the orderings are reflected in the correspondence analysis solution. This explains two important order phenomena which frequently occur in practice. Furthermore a multivariate generalization of the main theorem is given. The results support the use of (multi-) correspondence analysis as a scaling technique for categorical variables. M.G.

**N83-18383#** Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Mathematical Statistics.
**LOCATION ESTIMATORS AND SPREAD**
Chris A. J. Klaassen (Leiden Univ.) Apr. 1982 23 p refs Submitted for publication
(MC-SW-84/82) Avail: NTIS HC A02/MF A01

In the location estimation problem translation equivariant estimators are considered. It is shown that under a mild regularity condition the distribution of such estimators is more spread out than a particular distribution which is defined in terms of the sample size and the density of the i.i.d. observations. Some consequences of this so-called spread-inequality are discussed, namely the Cramer-Rao inequality, an asymptotic inequality of Hajek, and the efficiency of the maximum likelihood estimator in some nonregular cases. M.G.

**N83-18384#** Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Mathematical Statistics.
**THE ASYMPTOTIC VARIANCE OF ESTIMATORS FOR POSTERIOR PROBABILITIES**
A. W. Ambergen and W. Schaafsma (Groningen Univ., Netherlands) Aug. 1982 40 p refs Submitted for publication
(MC-SW-86/82) Avail: NTIS HC A03/MF A01

In this paper asymptotic variances of estimators for the posterior probability that an individual belongs to one of k >

or = 2 populations are presented. It is assumed that a set of k prior probabilities and a p > or = 1 dimensional vector of scores of the individual are given. In the model the populations are represented by multivariate normal distributions. The case with the assumption of homogeneity of dispersion matrices as well as the case without this assumption are treated. Further we give some crude preliminary proposals to deal with the general case 'k > or = 2, p > or = 1' where no normality assumptions are made. The last part of this paper deals with a case from physical anthropology. Author

# 66 SYSTEMS ANALYSIS

Includes mathematical modeling; network analysis; and operations research.

**N83-18385#** Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Operations Research.
**CONTROLLED INVARIANCE FOR NONLINEAR SYSTEMS: TWO WORKED EXAMPLES**
H. Nijmeijer and A. J. vanderSchaft (Groningen Univ., Netherlands) Mar. 1982 17 p refs Submitted for publication
(MC-BW-156/82) Avail: NTIS HC A02/MF A01

Two examples of disturbance decoupling for nonlinear systems are analyzed using the concept of controlled invariance. In the first example a feedback is explicitly constructed which decouples a disturbance from the vertical components of the axes of a rotating rigid body, while the second example deals with a particle in a potential field subject to a disturbance. M.G.

**N83-18386#** Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Operations Research.
**AN APPRAISAL OF COMPUTATIONAL COMPLEXITY FOR OPERATIONS RESEARCHERS**
J. K. Lenstra, A. H. G. RinnooyKan (Erasmus Univ.), and P. vanEmdeBoas (Amsterdam Univ.) Apr. 1982 22 p refs Submitted for publication
(MC-BW-159/82) Avail: NTIS HC A02/MF A01

Recent developments in the theory and practice of computational complexity are reviewed, in order to highlight some of the basic concepts and ideas that have come out of this area. The discussion centers around the progress on twelve important open problems listed in 1979 by M. R. Garey and D. S. Johnson, the introduction of probabilistic elements in the analysis and design of algorithms, the problem classes around P and NP, and the P is unequal to NP conjecture. ESA

**N83-18387#** Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Operations Research.
**SOLVING COVERING PROBLEMS AND THE UNCAPACITATED PLANT LOCATION PROBLEM ON TREES**
A. W. J. Kolen (Erasmus Univ.) Jun. 1982 29 p refs Submitted for publication
(MC-BW-163/82) Avail: NTIS HC A03/MF A01

Given a tree network on n vertices, a neighborhood subtree is defined as the set of all points on the tree within a certain radius of a given point, called the center. It is shown that for any two neighborhood subtrees containing the same endpoint of a longest path in the tree one is contained in the other. This result is then used to obtain O(n(2)) algorithms for the minimum cost covering problem and the minimum cost operating problem as well as an O(n(3)) algorithm for the uncapacitated plant location problem on the tree. M.G.

**N83-18388#** Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Operations Research.
**PREEMPTIVE SCHEDULING OF UNIFORM MACHINES SUBJECT TO RELEASE DATES**
J. Labetoulle (Centre National d'Etudes des Telecommun. Issy les Moulineaux, France), E. L. Lawler (California Univ., Berkeley), J. K. Lenstra, and A. H. G. RinnooyKan (Erasmus Univ.) Aug. 1982 23 p refs Revised Submitted for publication
(Grants NSF MCS-76-17605; NSF MCS-78-20054; NATO-9.202(SRG.77))
(MC-BW-166/82-Rev; MC-BW-99/79-Rev) Avail: NTIS HC A02/MF A01

Techniques for finding optimal preemptive schedules on parallel machines, subject to release dates for the jobs, are discussed. Two polynomial-time algorithms are presented. The first algorithm minimizes maximum completion time on an arbitrary number of uniform machines. The second algorithm minimizes maximum lateness with respect to due dates for the jobs on an arbitrary number of identical machines or on two uniform machines. A third algorithm for minimizing maximum lateness on an arbitrary number of uniform machines is briefly discussed. NP-hardness is established for the problem of minimizing total weighted completion time on a single machine. M.G.

**N83-18389#** Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Operations Research.
**ADAPTIVE STOCHASTIC FILTERING PROBLEMS: THE CONTINUOUS TIME CASE**
J. H. vanSchuppen Aug. 1982 10 p refs Presented at 2nd Bad Honnef Workshop on Stochastic Differential Systems Submitted for publication
(MC-BW-167/82) Avail: NTIS HC A02/MF A01

The adaptive stochastic filtering problem for Gaussian processes is considered. The selftuning-synthesis procedure is used to derive two algorithms for this problem. Almost sure convergence for the parameter estimate and the filtering error is established. The convergence analysis is based on an almost-supermartingale convergence lemma that allows a stochastic Lyapunov like approach. M.G.

**N83-18390#** Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
**PRECISION GUIDED SPACECRAFT. TECHNOLOGY AND OPERATIONAL ASPECTS**
Sep. 1982 104 p refs Symp. held in Norway, 4-7 May 1982
(AGARD-CP-320; ISBN-92-835-1434-3) Avail: NTIS HC A06/MF A01

Precision guided projectiles and missile control systems are discussed. Emphasis is upon high kill probability weapons directed against ground forces in combat situations in Europe. For individual titles, see N83-18391 through N83-18398.

**N83-18391#** Army Materiel Systems Analysis Activity, Aberdeen Proving Ground, Md.
**ANALYSIS OF THE INPACT OF BATTLEFIELD SCENARIOS ON PRECISION MUNITIONS**
Diana L. Frederick *In* AGARD Precision Guided Spacecraft. Technol. and Operational Aspects Sep. 1982 14 p refs (For primary document see N83-18390 08-66)
Avail: NTIS HC A06/MF A01

The computer methodology called the Scenario Analysis Model (SAM) is discussed. This model was developed to analyze the effects of terrain and battlefield induced obscuration on potential Precision Guided Munition (PGM) capabilities from various weapon/designator positions. The model inputs which include digitized terrain, digitized paths, obscurant data, target data, and position coordinates are discussed. Currently, four scenarios located in Germany are available for analysis. Summaries of the scenarios are included. The output of the SAM is useful in understanding the impact of scenario dependent factors on overall PGM utility. Some of the SAM output statistics are discussed. In particular, the degradation effects of obscuration on line-of-sight duration times, distributions of path segment lengths, and ranges to the target are presented for forward observer positions in the four scenarios. In addition, the degradation effects of obscuration on tanks, tow vehicles, and helicopter line of sight duration times for one scenario are presented. R.J.F.

**N83-18392#** Mitre Corp., Bedford, Mass.
**APPLICATION OF AN AIRBORNE ENGAGEMENT SYSTEM TO BATTLEFIELD SURVEILLANCE AND ATTACK CONTROL**

Donald D. Neuman *In* AGARD Precision Guided Spacecraft. Technol. and Operational Aspects Sep. 1982 9 p (For primary document see N83-18390 08-66)
Avail: NTIS HC A06/MF A01

The airborne engagement system is a surveillance and attack control system designed to detect, locate, track, and control weapons against time sensitive targets, moving and stationary, located up to 150 km or more beyond the forward line of its own troops. The airborne sensor broadcasts its target location data in real time for reception at multiple ground receiver locations including command, intelligence, and mission execution elements. Simultaneously with performing its surveillance and attack planning functions, the system provides target positioning data to inflight surface and air launched missiles and direct attack aircraft to an accuracy that supports the dispense of anti-armor submunitions as well as other conventional ordnance against fixed and moving targets. Given the proper weapon systems, data provided to direct attack aircraft allow low altitude ingress and egress, and blind weapon delivery (no pop-up) without overflight of the objective area. Data provided to the inflight missile allow for missile flight correction and adjustment of munition dispense in both time and location to compensate for target motion and missile navigation uncertanties. R.J.F.

**N83-18393#** General Dynamics Corp., Pomona, Calif. Technology Programs Dept.
**PRECISION GUIDED MUNITION SEEKER TECHNOLOGY**
T. Gordon Hame *In* AGARD Precision Guided Spacecraft. Technol. and Operational Aspects Sep. 1982 11 p (For primary document see N83-18390 08-66)
Avail: NTIS HC A06/MF A01

Recent seeker technology developments for application to autonomous target acquisition munitions is discussed. First, basic design approaches for infrared seekers are discussed and the use of two colors to achieve countermeasures and non-target discrimination is introduced. Experimental field test results show the degree of autonomous performance achieved under a variety of battlefield conditions. Next, millimeter wave seekers suitable for use on small diameter missiles, munitions and remotely piloted vehicles are described and the results of experimental hardware operating at 35 GHz and 140 GHz are shown. Finally, in view of the unpredictabiiity of battlefield conditions, two concepts for multi-mode terminal guidance are introduced and explored experimentally. A common aperture millimeter wave/two-color infrared seeker is described which combines a 140 GHz sensor with a two-color mid-infrared sensor for optimum battlefield performance. For air defense suppression applications, an experimental passive microwave/infrared seeker is discussed. R.J.F.

**N83-18394#** Marconi Space and Defence System Ltd., Stanmore (England). Guided Weapon Div.
**RADAR SEEKERS FOR PRECISION GUIDED MUNITIONS c32**
Douglas A. Ramsay *In* AGARD Precision Guided Spacecraft. Technol. and Operational Aspects Sep. 1982 15 p Sponsored in part by the UK Ministry of Defence (For primary document see N83-18390 08-66)
Avail: NTIS HC A06/MF A01

A general perspective is given on the evolution of radar guidance, utilizing the astonishing current advances in electronic technology, so as to overcome past disadvantages of radar guidance and to solve the problems of battlefield targets. Missile control, radar homing missiles, infrared detectors, and several types of missile systems are discussed. R.J.F.

**N83-18395#** Singer-Kearfott, Wayne, N. J.
**ADVANCED IMAGING TECHNIQUES FOR HIERARCHIES OF INTELLIGENT PGMs**
C. R. Giardina *In* AGARD Precision Guided Spacecraft. Technol. and Operational Aspects Sep. 1982 12 p refs Prepared in cooperation with Stevens Inst. of Technology (For primary document see N83-18390 08-66)
Avail: NTIS HC A06/MF A01

Levels of intelligence in precision guided missiles (PGM) are determined as a functional involving false alarm probabilities and non target detection error probabilities. For an apriori specified mission a minimal PGM IQ is needed; to help guarantee this minimal value, advanced image processing techniques were developed. It is assumed that the munition is fitted with a strapdown navigation and guidance system and a necessary imaging sensor such as infrared. Baseline imaging procedures are described common to all intelligence levels with additional methods given for PGMs with larger IQ's. A recently developed imaging algebra is applied to PGM systems; here operators are employed for image enhancement, restoration, segmentation, classification, and registration. Many of these new operators are based on counterparts in classical mathematical disciplines such as topology, linear and abstract algebra, and functional analysis. The operators described, along with stochastic procedures, help render the desired intelligence level. Preliminary algorithm design shall be conducted for real time digital process implementation. This will go hand-in-hand with computer architecture determination. R.J.F.

**N83-18396#** Army Missile Command, Redstone Arsenal, Ala. Guidance and Control Directorate.
**DEVELOPMENT OF LOW COST MULTIFUNCTION SENSORS FOR LIGHTWEIGHT FIRE AND FORGET ANTITANK WEAPON SYSTEM**
Joe S. Hunter and James C. Hung (Tennessee Univ.) *In* AGARD Precision Guided Spacecraft. Technol. and Operational Aspects Sep. 1982 17 p (For primary document see N83-18390 08-66)
Avail: NTIS HC A06/MF A01

The design description, operation, and preliminary evaluation of a multifunction sensing device that is capable of measuring two axes of angular rate and two axes of linear acceleration from a single instrument are discussed. The equations for obtaining three axes of angular rate and three axes of linear acceleration from a single instrument are also developed. Test data is presented that illustrates state-of-the-art performance on available multifunction sensors. Finally, methods of improving the performance of multifunction sensors are discussed. R.J.F.

**N83-18397#** Naval Surface Weapons Center, Dahlgren, Va.
**A GUIDANCE LAW FOR GENERAL SURFACE TARGETS**
W. R. Chadwick and C. M. Rose *In* AGARD Precision Guided Spacecraft. Technol. and Operational Aspects Sep. 1982 10 p refs Previously announced as X82-75611 (For primary document see N83-18390 08-66)
Avail: NTIS HC A06/MF A01

A guidance law is proposed for low-cost tactical missiles. Analysis of this law is carried out for fast-moving surface targets and stationary targets in the presence of gravity. The law is simple to implement using the velocity-vane pursuit-guidance seeker and for the above targets is as accurate as proportional navigation. R.J.F.

**N83-18398#** Army Materiel Systems Analysis Activity, Aberdeen Proving Ground, Md.
**OPERATIONAL AND EFFECTIVENESS CONSIDERATIONS FOR A TERMINALLY GUIDED WARHEAD (TGW) CONCEPT FOR THE MULTIPLE LAUNCH ROCKET SYSTEM (MLRS)**
Robert Chandler, Edward Panuska, and Michael Starks *In* AGARD Precision Guided Spacecraft. Technol. and Operational Aspects Sep. 1982 7 p (For primary document see N83-18390 08-66)
Avail: NTIS HC A06/MF A01

An effectiveness analysis of a terminally guided warheat (TGW)/multiple launch rocket system (MLRS) concept is discussed. The objective was to examine the effectiveness of this concept under a spectrum of anticipated battlefield weather environments in a European setting. MLRS/TGW effectiveness estimates against several typical Warsaw Pact targets are developed. Additionally, the sensitivity of effectiveness to parameters expected to critically affect system performance, such as response time and target vehicle signature, are examined. R.J.F.

# 67 THEORETICAL MATHEMATICS

Includes topology and number theory.

**N83-18399** Technische Universitaet, Munich (West Germany). Inst. fuer Mathematik.
**BOCHNER THEOREMS FOR HYPERGROUPS AND THEIR APPLICATIONS TO ORTHOGONAL POLYNOMIAL EXPANSIONS**
Rupert Lasser Mar. 1982 23 p refs
(TUM-M8204) Copyright. Avail: Issuing Activity

Bochner theorems are proved in the setting of commutative hypergroups. The Fourier transforms of positive measures, mu is a member of M(K), are characterized, where K is an arbitrary commutative hypergraph without assumptions on the dual character space of K. Applications for orthogonal polynomial expansions are described. M.G.

**N83-18400** Admiralty Marine Technology Establishment, Teddington (England).
**FREE-SPACE GREEN'S FUNCTIONS OF THE REDUCED WAVE EQUATION**
E. A. Skelton Sep. 1982 21 p refs
(AMTE(N)-TM-82073; BR85726) Copyright. Avail: Issuing Activity

The governing differential equations are solved by the method of separation of variables for the separate cases of Cartesian, cylindrical and spherical coordinate systems. The resulting integral/series expansions of the Green's functions for outgoing waves are then reduced to their standard and simple form. In addition to bringing together, in tabular form, a number of frequently used Green's functions an introduction to their derivation is also provided. Author

**N83-18401#** Stichting Mathematisch Centrum, Amsterdam (Netherlands). Dept. of Operations Research.
**TOTALLY-BALANCED AND GREEDY MATRICES**
A. J. Hoffman (IBM, Yorktown Heights, N.Y.), A. W. J. Kolen (Erasmus Univ.), and M. Sakarovitch (IMAG, Grenoble, France) Aug. 1982 19 p refs Submitted for publication
(MC-BW-165/82) Avail: NTIS HC A02/MF A01

Totally-balanced and greedy matrices are (0,1)-matrices defined by excluding certain submatrices. For a n x m (0,1)-matrix A it is shown that the linear programming problem max [by/yA< or = c, 0 < or = y < or = d] can be solved by a greedy algorithm for all c > or = 0, d > or = 0 and b1 > or = b2 > or = ... bn > or = 0 if and only if A is a greedy matrix. Furthermore it is shown constructively that if b is an integer, then the corresponding primal problem has an integer optimal solution. A polynomial-time algorithm is presented to transform a totally-balanced matrix into a greedy matrix as well as to recognize a totally-balanced matrix. This transformation algorithm together with the result on greedy matrices enables one to solve a class of integer programming problems defined on totally-balanced matrices. Two examples arising in tree location theory are presented. M.G.

# 70 PHYSICS (GENERAL)

For geophysics see *46 Geophysics*. For astrophysics see *90 Astrophysics*. For solar physics see *92 Solar physics*.

**N83-18402#** Wisconsin Univ., Madison. Dept. of Medical Physics.
**ANTI W COMPARISONS FOR A150 PLASTIC-EQUIVALENT GASES, TE GAS, AND AIR**
D. W. Pearson, P. M. DeLuca, Jr., M. C. Schell, F. H. Attix, M. Awschalon, I. Rosenberg, and R. K. TenHaken 1981 18 p refs Prepared in cooperation with Fermi National Accelerator Lab.
(Contract DE-AS02-76EV-01105)
(DE82-009370; DOE/EV-01105/286) Avail: NTIS HC A02/MF A01

Ionization ratios which are related to anti W ratios between gases in the p(66)Be(49) neutron beam were measured. Earlier measurements at the UW gas target H-3(d,n)He-4 neutron source were extended to include an uncollimated beam geometry with ion chambers close to the target. DOE

# 71 ACOUSTICS

Includes sound generation, transmission and attenuation. For noise pollution see *45 Environment Pollution*.

**N83-18403** Admiralty Marine Technology Establishment, Teddington (England).
**ACOUSTIC TRANSMISSION BETWEEN COUPLED CAVITIES**
A. J. Robins Jul. 1982 50 p refs
(AD-A121444; AMTE(N)R82002; BR85080) Copyright. Avail: Issuing Activity

As part of an investigation of flow induced cavity resonance, experimental studies were carried out, both in air and water, on systems of coupled cavities (i.e., cavities connected by a common opening). The effects on sound transmission between cavities, of parameters such as wall flexibility, fluid viscosity, and the size of opening connecting the cavities, was examined. Theoretical models were developed to describe the acoustic behavior of the cavity systems studied, and good agreement was obtained between theory and experiment. It is concluded that, for most practical applications, the effect of viscosity on sound transmission between resonating cavities is negligible. Flexibility of the boundaries is, however, a dominating factor whose effects are particularly noticeable when the fluid medium is water. M.G.

**N83-18404*#** Wyle Labs., Inc., El Segundo, Calif.
**A PILOT STUDY OF HUMAN RESPONSE TO GENERAL AVIATION AIRCRAFT NOISE Final Report**
John Stearns, Ron Brown, and Paul Neiswander Hampton, Va. NASA. Langley Research Center Jan. 1983 100 p refs
(Contract NAS1-15388)
(NASA-CR-166053; NAS 1.26:166053; WR-82-24) Avail: NTIS HC A05/MF A01 CSCL 20A

A pilot study, conducted to evaluate procedures for measuring the noise impact and community response to general aviation aircraft around Torrance Municipal Airport, a typical large GA airport, employed Torrance Airport's computer-based aircraft noise monitoring system, which includes nine permanent monitor stations surrounding the airport. Some 18 residences near these monitor stations were equipped with digital noise level recorders to measure indoor noise levels. Residents were instructed to fill out annoyance diaries for periods of 5-6 days, logging the time of each annoying aircraft overflight noise event and judging its degree of annoyance on a seven-point scale. Among the noise metrics studied, the differential between outdoor maximum A-weighted noise level of the aircraft and the outdoor background level showed the best correlation with annoyance; this correlation was clearly seen at only high noise levels, And was only slightly better than that using outdoor aircraft noise level alone. The results indicate that, on a national basis, a telephone survey coupled with outdoor noise measurements would provide an efficient and practical means of assessing the noise impact of general aviation aircraft. A.R.H.

**N83-18405*#** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
**AIRCRAFT TURBOFAN NOISE**
John F. Groeneweg and Edward J. Rice 1983 17 p refs Presented at the 28th Ann. Intern. Gas Turbine Conf., Phoenix, Ariz., 27-31 Mar. 1983
(NASA-TM-83317; E-1510; NAS 1.15:83317) Avail: NTIS HC A02/MF A01 CSCL 20A

Turbofan noise generation and suppression in aircraft engines are reviewed. The chain of physical processes which connect unsteady flow interactions with fan blades to far field noise is addressed. Mechanism identification and description, duct propaga-

tion, radiation and acoustic suppression are discussed. The experimental technique of fan inflow static tests are discussed. Rotor blade surface pressure and wake velocity measurements aid in the determination of the types and strengths of the generation mechanisms. Approaches to predicting or measuring acoustic mode content, optimizing treatment impedance to maximize attenuation, translating impedance into porous wall structure and interpreting far field directivity patterns are illustrated by comparisons of analytical and experimental results. The interdependence of source and acoustic treatment design to minimize far field noise is emphasized. Area requiring further research are discussed and the relevance of aircraft turbofan results to quieting other turbomachinery installations is addressed. S.L.

**N83-18406*#** Comtek, Grafton, Va.
**ADAM: AN AXISYMMETRIC DUCT AEROACOUSTIC MODELING SYSTEM Final Report**
A. Louis Abrahamson Washington NASA Jan. 1983 91 p refs (NASA-CR-3668; NAS 1.26:3668) Avail: NTIS HC A05/MF A01 CSCL 20A

An interconnected system of computer programs for analyzing the propagation and attenuation of sound in aeroengine ducts containing realistic compressible subsonic mean flows, ADAM was developed primarily for research directed towards the reduction of noise emitted from turbofan aircraft engines. The two basic components are a streamtube curvature program for determination of the mean flow, and a finite element code for solution of the acoustic propagation problem. The system, which has been specifically tailored for ease of use, is presently installed at NASA Langley Reseach Center on a Control Data Cyber 175 Computer under the NOS Operating system employing a Tektronix terminal for interactive graphics. The scope and organization of the ADAM system is described. A users guide, examples of input data, and results for selected cases are included. A.R.H.

**N83-18407*#** Stanford Univ., Calif. Dept. of Aeronautics and Astronautics.
**TRANSMISSION OF SOUND ACROSS A VORTEX LAYER ENCLOSING A CYLINDRICAL COLUMN OF JET**
Raymond Luh and C. C. Chao Aug. 1982 142 p refs
(Contract NCC2-76)
(NASA-CR-169845; NAS 1.26:169845; SU-JIAA-TR-50) Avail: NTIS HC A07/MF A01 CSCL 20A

An approximate solution to the problem of transmission of sound across a cylindrical vortex was obtained. Results are considerably different from the plane vortex sheet case because of the added role played by the curvature of the jet. In comparison with the plane case, the specularly transmitted waves are more complex and require some numerical integration. Resonance waves are identically predicted for $M > 2$, but there is also a wave field whose modified effect appears to extend the region of resonance just as the instability waves cover a region in space and time. The instability waves are predicted to exist for all Mach numbers but vanish for wavelengths that are large compared to the jet radius. The region of propagation is similarly wavelength dependent. A.R.H.

**N83-18408*#** General Electric Co., Cincinnati, Ohio. Aircraft Engine Business Group.
**FREE-JET ACOUSTIC INVESTIGATION OF HIGH-RADIUS-RATIO COANNULAR PLUG NOZZLES. COMPREHENSIVE DATA REPORT, VOLUME 1**
P. R. Knott, B. A. Janardan, R. K. Majjigi, P. K. Shutiani, and P. G. Vogt Jan. 1981 859 p refs
(Contract NAS3-20619)
(NASA-CR-168086-Vol-1; NAS 1.26:168086-Vol-1; R81AEG212-Vol-1) Avail: NTIS HC A99/MF A01 CSCL 20A

Six coannular plug nozzle configurations having inverted velocity and temperature profiles, and a baseline convergent conical nozzle were tested for simulated flight acoustic evaluation in General Electric's Anechoic Free-Jet Acoustic Facility. The nozzles were tested over a range of test conditions that are typical of a Variable Cycle Engine for application to advanced high speed aircraft. The outer stream radius ratio for most of the configurations was 0.853, and the inner-stream-outer-stream area ratio was tested in the range of 0.54. Other variables investigated were the influence of bypass struts, a simple noncontoured convergent-divergent outer stream nozzle for forward quadrant shock noise control, and the effects of varying outer stream radius and inner-stream-to-outer-stream velocity ratios on the flight noise signatures of the nozzles. It was found that in simulated flight, the high-radius-ratio coannular plug nozzles maintain their jet noise and shock noise reduction features previously observed in static testing. The presence of nozzle bypass structs will not significantly effect the acoustic noise reduction features of a General Electric-type nozzle design. A unique coannular plug nozzle flight acoustic spectral prediction method was identified and found to predict the measured results quite well. Special laser velocimeter and acoustic measurements were performed which have given new insight into the jet and shock noise reduction mechanisms of coannular plug nozzles with regard to identifying further beneficial research efforts. Author

**N83-18409*#** General Electric Co., Cincinnati, Ohio.
**FREE-JET ACOUSTIC INVESTIGATION OF HIGH-RADIUS-RATIO COANNULAR PLUG NOZZLES. COMPREHENSIVE DATA REPORT, VOLUME 2**
P. G. Vogt, P. K. Bhutiani, and P. H. Knott Jan. 1981 782 p refs
(Contract NAS3-20619)
(NASA-CR-168086-Vol-2; NAS 1.26:169086-Vol-2; R81AEG212-Vol-2) Avail: NTIS HC A99/MF A01 CSCL 20A

Laser velocimeter data, collected as part of an acoustic investigation of coannular plug nozzles, is provided. The type of traverse, position, and histogram number is given along with the mean and turbulent velocity data. The velocites are normalized with respect to the outer flow velocity and the 'mixed' velocity. N.W.

**N83-18410*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
**SONIC BOOM MEASUREMENT TEST PLAN FOR SPACE SHUTTLE STS-1 REENTRY**
Herbert R. Henderson Apr. 1981 46 p
(NASA-TM-85222; NAS 1.15:85222) Avail: NTIS HC A03/MF A01 CSCL 20A

Formal documentation for measurement procedures and system specifications, and general information are relating to the Space Shuttle STS-1 Sonic Boom Measurement Program are supplied. This test plan is designed to provide information, guidance, and assignment of responsibilities for the acquisition of sonic boom and atmospheric measurements, timing correlation, communications and other necessary supporting tasks. Specifically included are details such as mobile data acquisition station locations, measurement systems calibration levels, predicted sonic boom overpressure levels, overpressure level assignment for each data acquisition station, data recording times on and off, universal coordinated time, and measurement system descriptions. J.M.S.

**N83-18411*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
**SONIC BOOM MEASUREMENT TEST PLAN FOR SPACE SHUTTLE STS-3 REENTRY**
Herbert R. Henderson Mar. 1982 31 p refs
(NASA-TM-85223; NAS 1.15:85223) Avail: NTIS HC A03/MF A01 CSCL 20A

The lateral area from the reentry ground track affected by sonic boom overpressure levels is determined. Four data acquisition stations are deployed laterally to the STS-3 reentry flight track. These stations provide six intermediate band FM channels of sonic boom data, universal time synchronization, and voice annotation. All measurements are correlated with the vehicle reentry flight track information along with atmospheric and vehicle operation conditions. S. L.

**N83-18412*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
**SONIC BOOM MEASUREMENT TEST PLAN FOR SPACE SHUTTLE STS-4 REENTRY**
Herbert R. Henderson Jun. 1982 32 p refs
(NASA-TM-85224; NAS 1.15:85224) Avail: NTIS HC A03/MF A01 CSCL 20A

Formal documentation for measurement procedures and system specifications, and general information relating to the Space Shuttle STS-4 Sonic Boom Measurement Program are supplied. This test plan is designed to provide information, guidance, and assignment of responsibilities for the acquisition of sonic boom and atmospheric measurements, timing correlation, communications and other necessary supporting tasks. Specifically included are details such as mobile data acquisition station locations, measurement systems calibration levels, predicted sonic boom overpressure levels, overpressure level assignment for each data acquisition station, data recording times on and off, universal coordinated time, and measurement system descriptions. J.M.S.

**N83-18413*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
**SONIC BOOM MEASUREMENT TEST PLAN FOR SPACE SHUTTLE STS-5 LAUNCH**
Herbert R. Henderson Nov. 1982 42 p refs
(NASA-TM-85225; NAS 1.15:85225) Avail: NTIS HC A03/MF A01 CSCL 20A

Sonic booms measurements are obtained at key locations within the focus region and the lateral attenuation rate during ascent is determined in order to assess the validity of existing capability to predict the extent of focus boom area, the number of booms within the various zones (focus and nonfocus regions), the overpressures, and focus factors. The sonic boom focus region, consists of a region on the ground (in the form of an inverted 'horseshoe' pattern) in which higher than nominal overpressures can occur. S. L.

**N83-18414#** Pittler Maschinenfabrik A.G., Langen (West Germany).
**NOISE REDUCTION ON MULTI-SPINDLE AUTOMATIC LATHES Final Report, Jul. 1981**
Peter Dietz Bonn Bundesministerium fuer Forschung und Technologie Oct. 1982 85 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie Prepared in cooperation with Mueller-BBM GmbH and technische Univ., Aachen
(BMFT-FB-HA-82-024; ISSN-0171-7618) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 17, 50

The purpose of this project was to define the major noise emitting sources in multi-spindle automatic lathes during machining and indexing operations. Noise levels as specified by the working ordinance (Arbeitsstattenverordnung) are to be obtained or reduce by secondary and predominantly primary actions. The following actions will lead towards considerable noise level reductions to obtain the above targets: (1) by boxing-in actions as additional and supplementary means for existing workshop places. Depending on the actions taken a noise level reduction of between 6 to 11 dB(A) will result; (2) by modifications in the design of head stock and gear boxes according to the principle of assignment division together with boxing-in actions of integrated parts. A comparable late model machine shows an improvement of a minimum of 6 dB(A) even after doubling the operating speed; (3) by design and manufacturing modification of machine parts as gears, clutches, cams and indexing devices. Improvement of the mostly impulse type noise peaks by approximately 1 to 4 dB (impulse sound). Author

**N83-18415#** Oak Ridge National Lab., Tenn.
**STUDIES OF ULTRASONIC BEAM SPREAD IN THICK SECTIONS**
R. W. McClung, K. V. Cook, and P. J. Latimer (Ohio State Univ., Columbus) 1981 7 p ref Presented at the ASNT Fall Conf., Atlanta, 12 Oct. 1981
(Contract W-7405-eng-26)
(DE82-001440; CONF-811003-4) Avail: NTIS HC A02/MF A01

The use of hemispherical holes seems to be a valid procedure for monitoring both forward and lateral beam spread. Provided subsequent data analysis and checks show agreement, this type of reflector would be recommended for Code application. The preliminary evaluation of the 45 degrees, 2.25 MHz, 2.54-cm (1-in.) circular transducer case shows consistent results and determines an effective beam width that impacts scanning overlap or index. Additional work should be conducted in order to determine the effects of search unit differences (especially those affecting spectrum, near field, and small changes in the angular orientation). These search unit differences are expected to have even more effect on data for larger angles (e.g., 70 degrees). A decided improvement in the determination of the linear parameters such as slope and intercept could be obtained by using a greater number of side-drilled holes and hemispherical reflectors. The increased number of data points should greatly improve the quality of the linear fit and help determine reproducibility of the method. Author

**N83-18416#** Energy and Minerals Research Co., Exton, Pa.
**ULTRASONICALLY ENHANCED SIZE REDUCTION OF COAL Quarterly Technical Progress Report, 26 Sep. - 25 Dec. 1981**
W. B. Tarpley, Jr., H. M. Stephey, and S. R. Taylor Jan. 1982 12 p
(Contract DE-AC22-81PC-42268)
(DE82-008679; DOE/PC-42268/T2; QTPR-2) Avail: NTIS HC A02/MF A01

Preliminary work in ultrasonic grinding of coal over a broad range of feed stock and final product has been very promising. The beneficial effects of an ultrasonic assist to the grinding procedure include: rapid cyclic promotion of fatigue crack growth (10,000 to 50,000 cycles per second); preferential delivery of energy to discontinuities; reduction of particulate shielding by deagglomeration; promotion of stress corrosion cracking with grinding aids (as in moist grinding); cavitation grinding in a moist environment; and preferential shear. This work is expected to demonstrate the beneficial effects of ultrasonic coal comminution on a controlled laboratory scale, to evaluate grinding selectivity, and to obtain a preliminary estimate of the power required. DOE

# 72 ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure and molecular spectra.

**N83-18417** National Physical Lab., Teddington (England). Div. of Radiation Science and Acoustics.
**AN INVESTIGATION, OVER THE RANGE OF CONDITIONS OCCURRING IN RADIATION PROCESSING PLANTS, OF THE PERFORMANCE OF ROUTINE DOSIMETERS OF THE TYPE BASED ON POLYMETHYL METHACRYLATE, PART 1**
J. H. Barrett, P. H. G. Sharpe, and I. P. Stuart Jan. 1980 72 p refs 2 Vol.
(Contract UK-GPEI-89/0481)
(NPL-RS-49; ISSN-0143-7135) Copyright. Avail: Issuing Activity

The thickness and background optical density variations encountered within a batch of dosimeters were studied and the relationship between thickness and background was determined for Red 4034H and HX5. The effect of post irradiation storage temperature on Red 4034H and HX5 was studied over the range 25 to 50 C. Detailed observations made at short times after irradiation were compared with both optical and E.S.R. data. The timescale of observation was extended to cover the complete period of oxygen diffusion through the dosimeter. The effect of irradiation temperature on Red 4034H and HX5 was also studied over the range 25 to 50 C. Evidence is presented which suggests that the optimum wavelength for readout of HX Perspex may be dependent on the batch being used. S.L.

**N83-18418** National Physical Lab., Teddington (England). Div. of Radiation Science and Acoustics.
**AN INVESTIGATION, OVER THE RANGE OF CONDITIONS OCCURRING IN RADIATION PROCESSING PLANTS, OF THE PERFORMANCE OF ROUTINE DOSIMETERS OF THE TYPE BASED ON POLYMETHYL METHACRYLATE, PART 2**
J. H. Barett, P. H. G. Sharpe, and I. P. Stuart Jan. 1981 24 p refs 2 Vol.
(Contract UK-GPEI-89/0481)
(NPL-RS-52; ISSN-0143-7135) Copyright. Avail: Issuing Activity

Polymethyl methacrylate (Perspex) in the form of thin strips is used as a dosimeter in the 5 to 50kGy range. Two distinct types of systems were developed, both of which depend on a radiation induced change in optical absorption as the means of assessing absorbed dose. Perspex HX(+) is, in principle, the simpler of the systems. Polymerization of a monomer without additives is initiated by benzoyl peroxide and is continued until a specified (low) amount of residual monomer remains. On irradiation degradation products of the polymer build up in the matrix and optical density measurement in the 300 to 320 nm region allows their concentration to be determined. Red 4034 Perspex typifies the second type of system although other formulations were developed. Dye molecules are incorporated into the polymer during manufacture and on irradiation polymer radicals react with dye molecules to produce optical absorption in the visible region of the spectrum (600 to 650 nm in the case of Red 4034). S.L.

**N83-18419** National Physical Lab., Teddington (England). Div. of Radiation Science and Acoustics.
**PRIMARY STANDARDS OF EXPOSURE FOR 50kV X-RAYS. INTERCOMPARISONS BETWEEN THE 1958 AND 1978 DESIGNS OF FREE AIR CHAMBERS**
A. R. S. Marsh and T. T. Williams Apr. 1982 28 p refs
(NPL-RS(EXT)55; ISSN-0143-7135) Copyright. Avail: Issuing Activity

The parallel plate free-air ionization chamber designed in 1958 and used at NPL since then as the primary standard for X-ray exposure for X-rays generated at up to 50 kV was replaced in 1979 by a new chamber. This latter chamber, designated the 1978 design was experimentally intercompared with the 1958 chamber both directly and in the course of a secondary standard dosimeter calibration session. These intercomparisons at both therapy and protection levels are covered. Author

**N83-18420** National Physical Lab., Teddington (England). Div. of Radiation Science and Acoustics.
**COMPARISON OF THE NPL AND PTB ABSORBED DOSE RATE STANDARDS FOR BETA RADIATION AT PROTECTION LEVELS**
B. Owen Nov. 1981 31 p refs
(Contract CEC-1161/1-80)
(NPL-RS-57; ISSN-0143-7135) Copyright. Avail: Issuing Activity

The comparison of the NPL and PTB primary Standards was carried out by each laboratory using its standard to measure the absorbed dose rates from a number of NPL secondary standard sources of the radionuclides strontium + yttrium-90 (Sr + Y - 90), thallium-204 (T1-204) and promethium-147 (Pm-147). Author

**N83-18421** National Physical Lab., Teddington (England). Div. of Radiation Science and Acoustics.
**DICHROMATE SOLUTION AS A REFERENCE DOSEMETER FOR USE IN INDUSTRIAL IRRADIATION PLANTS**
P. H. G. Sharpe, J. H. Barrett, and A. M. Berkley Oct. 1982 30 p refs
(Contract UK-GPEI-89/0585)
(NPL-RS(EXT)60; ISSN-0143-7135) Avail: Issuing Activity

The radiolytic reduction of dichromate ion in aqueous solution was investigated as a dosimetry system for reference purposes in the 10 to 40 kGy range. Preliminary work showed 0.4 M sulphuric acid to be unsuitable as a solvent for dichromate and all work reported here has been carried out in 0.1 M perchloric acid solution. An initial concentration of dichromate ions of 2.5 mM was judged optimal for this dose range and measurement wavelength of 440 nm is suggested. Deviations from the Beer-Lambert law at this wavelength were investigated and extinction coefficients are reported for both dichromate ion and chromic (Cr(III)) ion. Solutions were found to be stable after irradiation, even when stored at elevated temperatures. The difference in reduction yield between batches of solution was shown to be less than + or - 0.5%. The effect of irradiation temperature on reduction yield was determined to be -0.2% per deg C over the range 20 to 50 C. Author

**N83-18422*#** Stanford Univ., Calif. Labs. of Physics.
**SPONTANEOUS RAMAN SCATTERING AS A HIGH RESOLUTION XUV RADIATION SOURCE**
J. E. Rothenberg, J. F. Young, and S. E. Harris Jan. 1983 46 p refs Sponsored in part by Army Research Office
(Grant NAG2-44; Contract F49620-80-C-0023)
(NASA-CR-169857; NAS 1.26:169857; SU-GL-3539) Avail: NTIS HC A03/MF A01 CSCL 20H

A type of high resolution XUV radiation source is described which is based upon spontaneous anti-Stokes scattering of tunable incident laser radiation from atoms excited to metastable levels. The theory of the source is summarized and two sets of experiments using He (1s2s)(1)S atoms, produced in a cw hollow cathode and in a pulsed high power microwave discharge, are discussed. The radiation source is used to examine transitions originating from the 3p(6) shell of potassium. The observed features include four previously unreported absorption lines and several sharp interferences of closely spaced autoionizing lines. A source linewidth of about 1.9 cm(-1) at 185,000 cm(-1) is demonstrated. M.G.

**N83-18423*#** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
**CERENKOV RADIATOR MATERIAL AND CHARGED PARTICLE DETECTION PROCESS Patent Application**
V. K. Balasubrahmanyan, Jonathan F. Ormes, and Robert E. Streitmatter, inventors (to NASA) Filed 10 Jan. 1983 11 p
(NASA-Case-GSC-12805-1; US-Patent-Appl-SN-456907) Avail: NTIS HC A02/MF A01 CSCL 20H

A solid, nonconducting, transparent material having an index of refraction of about 1.4 is provided for detection of high speed charged particles by dispersing a waveshifter containing fluorescent dyes throughout a silicone based rubber compound known as RTV 615. The fluorescent dyes, para-terphenyl, bis (o-methyl styryl) benzene, and polyphenylene oxide, absorb ultraviolet radiation caused by passage of the particles through the material and re-emit the radiation absorbed as radiation in the blue region of the visible spectrum. NASA

**N83-18424#** California Univ., Livermore. Lawrence Livermore Lab.
**STUDIES OF THE NUCLEAR EQUATION OF STATE USING NUMERICAL CALCULATIONS OF NUCLEAR DROPS COLLISIONS**
C. T. Alonso, J. M. LeBlanc, and J. R. Wilson Nov. 1981 13 p refs Presented at the 2nd Conv. of the Intern. Colloq. on Drops and Bubbles, Monterey, Calif., 19-21 Nov. 1981
(Contract W-7405-eng-48)
(DE82-005869; UCRL-86964; CONF-811174-2) Avail: NTIS HC A02/MF A01

A numerical calculation for the full thermal dynamics of colliding nuclei has been developed. Preliminary results are reported for the thermal fluid dynamics in such processes as Coulomb scattering, fusion, fusion-fission, bulk oscillations, compression with heating, and collisions of heated nuclei. DOE

**N83-18425#** Korea Advanced Energy Research Inst., Seoul.
**STUDY ON THE NEUTRON ACTIVATION ANALYSIS**
K. R. Yang, N. B. Kim, and K. Y. Lee 1981 34 p refs In JAPANESE; ENGLISH summary
(DE82-700244; KAERI/RR-272-80) Avail: NTIS (US Sales Only) HC A03/MF A01; DOE Depository Libraries

A preconcentration of trace impurities and radiochemical separation scheme for neutron activation analysis is developed

for the determination of 23 elements in nuclear fuel uranium. PH 3 solution of sulfuric acid contained uranium ions(VI) is loaded on anion-exchange resin column (Dowex 1 x 8, 100 - 200 Mesh) for separation of impurities from uranium. All of uranium ions are absorped on the anion exchange resin but 23 elements of impurities are eluated over 98%. After irradiation of the eluate the radiochemical separation scheme is applied. The scheme is based on a group separation using ion-exchange resin and mineral exchanger. Present work has employed mineral acids and their partly organic mixture excluding HF as the media as well as common glass wares. For the determination, gamma-ray spectroscopy using 3 in x 3 in NaI (Tl) detector and a single comparator method are used. DOE

**N83-18426#** Los Alamos Scientific Lab., N. Mex.
**OCTUPOLE FOCUSING IN TRANSPORT AND ACCELERATION SYSTEMS**
K. R. Crandall, M. Pabst (Kernforschungszentrum Karlsruhe), R. H. Stokes, and T. P. Wangler 1981 5 p refs Presented at the Linear Accelerator Conf., Santa Fe, N. Mex., 19-21 Oct. 1981
(Contract W-7405-eng-36)
(DE82-006128; LA-UR-81-3058; CONF-811083-17) Avail: NTIS HC A02/MF A01

Higher multipole systems are studied to determine their capability for focusing and accelerating very high currents. A radio frequency octupole (RFO) transport system was examined, and a smooth approximation analytical description that includes the conditions for input radial matching of a zero space charge beam was developed. A multiparticle beam dynamics simulation program that accepts the low current matched beam and gradually increases the beam current as it is transported was constructed. This results in a matched high current beam, and the procedure can be used to determine the saturation current limit of a periodic octupole system. As expected, at high currents the beam develops a hollow radial distribution that reduces the space charge defocusing; initial results show that high currents can be transported. For acceleration, the design parameters for a section of RFO linac, including the potential function, acceleration, and focusing efficiencies, and the geometry of the radially modulated pole tips were formulated. DOE

**N83-18427#** Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Chemistry.
**NUCLEAR RESEARCH WITH HEAVY IONS Annual Progress Report, 1 Jan. - 31 Dec. 1981**
Morton Kaplan Nov. 1981 38 p refs
(Contract DE-AS02-76ER-13246)
(DE82-007826; DOE/ER-13246/21) Avail: NTIS HC A03/MF A01

The experimental research program is primarily concerned with the nuclear reactions induced by collisions between heavy ion projectiles and complex target nuclei, the dynamics and thermodynamics associated with such collisions, and the relationships of the observables to the equilibrium and nonequilibrium properties of nuclear matter. As a sensitive probe of the nuclear interactions, detailed measurements of light charged particle emission were performed using counter telescopes for atomic number and mass number identification. Preliminary results from a new experiment on direct and evaporation like emission of (4)He from reactions of 340-MeV(40)Ar with (238)U are reported. Using a large two dimensional position sensitive avalanche detector, and measuring three fold coincidence events between two fission fragments and an emitted (4)He particle, emission processes were distinguishable in fusion like fission from those associated with inelastic reactions. DOE

**N83-18428#** Brookhaven National Lab., Upton, N. Y.
**MONTE CARLO STUDIES OF QUARK-GLUON DYNAMICS**
Michael Creutz 1981 5 p refs Presented at the Div. of Particles and Fields of the Am. Phys. Soc. Meeting, Santa Cruz, Calif., 9-11 Sep. 1981
(Contract DE-AC02-76CH-00016)
(DE82-001808; BNL-30136; CONF-810986-1) Avail: NTIS HC A02/MF A01

Recent progress in understanding strong interaction physics through Monte Carlo simulation of lattice gauge theory is reviewed. DOE

**N83-18429#** Clarkson Coll. of Technology, Potsdam, N.Y.
**FLUORESCENT SCATTERING BY MOLECULES EMBEDDED IN SMALL PARTICLES Progress Report, 1 Feb. 1981 - 31 Jan. 1982**
Herman Chew and Peter J. McNulty 31 Jan. 1982 7 p refs Presented at the 11th Intern. Conf. on Solid Nucl. Track Detectors, Bristol, Engl., 7 Sep. 1981
(Contract DE-AS02-77EV-04361)
(DE82-004881; CONF-8109100-4) Avail: NTIS HC A02/MF A01

In earlier work a model of fluorescent and Raman scattering by active molecules represented as classical electric dipoles embedded in small particles was developed. The intensity and angular distribution of the inelastically scattered radiation was shown to depend on the geometric and optical properties of the particle. The model was originally developed for particles having spherical shape and later extended to concentric spheres, cylinders, and prolate spheroids. The active molecules were originally assumed to be isotropically polarizable. The model was recently extended to certain types of anisotropically polarizable molecules. The model had also been applied to particles having internal structure. DOE

**N83-18430#** Rockefeller Univ., New York.
**WHAT CAN WE LEARN FROM LEPTON-LEPTON INTERACTIONS**
A. I. Sanda 1981 11 p refs Presented at the Intern. Conf. on Phys. in Collision: High Energy ee/ep/pp Interactions, Blacksburg, Va., 28 May 1981
(Contract DE-AC02-81ER-40033)
(DE82-007561; DOE/ER-40033/2; CONF-8105109-5) Avail: NTIS HC A02/MF A01

Measurements of mass, width, and observation of decay products from Z(0) can yield an incredible amount of information about the underlying theory. The highlights of Z(0) physics and B meson CP violation are discussed. DOE

**N83-18431#** Princeton Univ., N. J. Plasma Physics Lab.
**HEATING EFFICIENCY OF HIGH-POWER PERPENDICULAR NEUTRAL-BEAM INJECTION IN PDX**
R. J. Hawryluk, V. Arunasalam, M. Bell, M. Bitter, K. Bol, K. Brau, S. Davis, F. Dylla, H. Eubank, M. Finkenthal et al Mar. 1982 15 p refs Prepared in cooperation with UKAEA, Culham, England and Max-Planck Inst. fuer Plasmaphys., Garching, West Germany and Nagoya Univ.
(Contract DE-AC02-76CH-03073)
(DE82-008318; PPPL-1882) Avail: NTIS HC A02/MF A01

The heating efficiency of high power (up to 7.2 MW) near perpendicular neutral beam injection in the PDX Tokamak is comparable to that of tangential injection in PLT. Collisionless plasmas with central ion temperatures up to 6.5 keV and central electron temperatures greater than 2.5 keV have been obtained. The plasma pressure, including the contribution from the beam particles, increases with increasing beam power and does not appear to saturate, although the parametric dependence of the energy confinement time is different from that observed in ohmic discharges. DOE

**N83-18432#** Los Alamos Scientific Lab., N. Mex.
**PION PRODUCTION BY TARGET EMISSION**
W. R. Gibbs 1981 22 p refs Presented at the AIP Conf. on Pion Production, Bloomington, Ind., 22-24 Oct. 1981
(Contract W-7405-eng-36)
(DE82-010413; LA-UR-82-102; CONF-8110152-2) Avail: NTIS HC A02/MF A01

The coherent production of pions in a proton nucleus collision is calculated. The energy region considered is below the nucleon-nucleon threshold so that the entire nucleus must take part in the process. The amplitude for this reaction is broken into two parts,

the first part being characterized by initial emission of the pion from the projectile and the second part by initial emission from the target nucleus. The second part is emphasized. The target nuclei (12)C and (209)Bi are considered. Total production cross sections as a function of energy and some angular distributions are calculated. DOE

**N83-18433#** California Univ., Berkeley. Lawrence Berkeley Lab.
**CHARMED BARYON DECAYS OBSERVED IN POSITRON ELECTRON Ph.D. Thesis**
Eric Nelson Vella Dec. 1981 127 p refs
(Contract W-7405-eng-48)
(DE82-005159; LBL-13845) Avail: NTIS HC A07/MF A01

Various weak decays of the charmed baryon lambda sub c are observed in the Mark II detector at the SLAC e(+)e(-) storage ring SPEAR. Hadronic decays resulting in pK(-) pi(+) and pK(0) sub s and their conjugates are observed as peaks in invariant mass spectra at (2286 + or - 6) MeV/c(2). An estimate of the charmed baryon production cross section, derived from Mark II measurements of the inclusive baryon cross sections R sub p and R sub lambda as functions of center of mass energy, is used to calculate branching ratios for hadronic decay. An attempt is also made to observe higher mass charmed baryons by reconstructing cascade decays sigma sub c yields lambda sub c pi. Evidence for the observation of semileptonic decays of the charmed baryon is presented. Direct electrons are observed in events containing antiprotons, lambdas and antilambdas. DOE

**N83-18434#** Brookhaven National Lab., Upton, N. Y. National Synchrotron Light Source.
**NATIONAL SYNCHROTRON LIGHT SOURCE VUV AND SOFT X-RAY BEAM LINES: PERFORMANCE CHARACTERISTICS**
Roger W. Klaffky, Malcolm R. Howells, Gwyn P. Williams, Peter Z. Takacs, and Jules B. Godel 1981 21 p refs Presented at the 2nd Natl. Conf. on Synchrotron Radiation Instrumentation, Ithaca, N.Y., 15-17 Jul. 1981
(Contract DE-AC02-76CH-00016)
(DE82-010253; BNL-29966; CONF-810750-12) Avail: NTIS HC A02/MF A01

Five beam lines are being constructed. They involve a 2.75 deg toroidal grating monochromator, a plane grating grazing monochromator, a large aperture modified Wadsworth monochromator, a Seya-Namioka instrument and a Czerny-Turner instrument. These beam lines and their anticipated operational characteristics are discussed. DOE

**N83-18435#** Department of Energy, Washington, D. C. Div. of Chemical Sciences.
**STABLE ISOTOPE RESEARCH POOL INVENTORY**
Jan. 1982 59 p
(INCD(USA)-87/G; NEANDC(US)-211/A; DOE/NDC-26) Avail: NTIS HC A04/MF A01

A listing is presented of electromagnetically separated stable isotopes which are available for distribution within the United States for nondestructive research use from the Oak Ridge National Laboratory on a loan basis. This inventory includes all samples of stable isotopes in the Material Research Collection and does not designate whether a sample is out on loan or in reprocessing. For some of the high abundance naturally occurring isotopes, larger amounts can be made available. DOE

**N83-18436#** Wisconsin Univ., Madison. Dept. of Medical Physics.
**TRANSPORT CALCULATIONS FOR A 14.8 MeV NEUTRON BEAM IN A WATER PHANTOM**
S. J. Goetsch 1981 22 p refs
(Contract DE-AS02-76EV-01105)
(DE82-009364; DOE/EV-01105/281) Avail: NTIS HC A02/MF A01

A coupled neutron/photon Monte Carlo radiation transport code (MORSE-CG) was used to calculate neutron and photon doses in a water phantom irradiated by 14.8 MeV neutron from the gas target neutron source. The source-collimator-phantom geometry was carefully simulated. Results of calculations utilizing two different statistical estimators (next collision and track length) are presented. DOE

**N83-18437#** California Univ., Berkeley. Materials and Molecular Research Div.
**ANGULAR DISTRIBUTION AND ATOMIC EFFECTS IN CONDENSED PHASE PHOTOELECTRON SPECROSCOPY Ph.D. Thesis**
Richard Francis Davis Nov. 1981 386 p refs
(Contract W-7405-eng-48)
(DE82-008427; LBL-13511) Avail: NTIS HC A17/MF A01

A general concept of condensed phase photoelectron spectroscopy is that angular distribution and atomic effects in the photoemission intensity are determined by different mechanisms, the former being determined largely by ordering phenomena such as crystal momentum conservation and photoelectron diffraction while the latter are manifested in the total (angle-integrated) cross section. In this work, the physics of the photoemission process is investigated in several very different experiments to elucidate the mechanisms of, and correlation between, atomic and angular distribution effects. Theoretical models are discussed and the connection between the two effects is clearly established. DOE

**N83-18438#** Illinois Inst. of Tech., Chicago. Dept. of Physics.
**BACK TO BACK JETS IN QCD: COMPARISON WITH EXPERIMENT**
John C. Collins and Davison E. Soper (Oregon Univ., Eugene) Nov. 1981 13 p refs
(Contracts DE-AC02-80ER-10712; EY-76-S-06-2230)
(DE82-008399; DOE/ER-70004/319) Avail: NTIS HC A02/MF A01

Theory and experiment are compared for the energy-energy correlation function in the reaction e(+) = 3(-) yields A + B + X, with hadrons A and B nearly back to back. This correlation function is sensitive to the transverse momentum transfers incurred in quark decay. DOE

**N83-18439#** Oregon Univ., Eugene. Inst. of Theoretical Science.
**CONSTRAINTS AMONG STRUCTURE FUNCTIONS**
Rudolph C. Hwa and M. Sajjad Zahir (Victoria Univ.) Nov. 1981 13 p refs Sponsored in part by the Natural Science and Engineering Research Council of Canada
(Contracts DE-AT06-76ER-70004; EY-76-S-06-2230)
(DE82-008493; DOE/ER-70004-321) Avail: NTIS HC A02/MF A01

It is shown that a simple constraint between F2/sup mu n//F2/sup mu p/ and F2/sup nu p//F2/sup mu p/ derived from the basic properties of QCD that are contained in the quark-parton model is not satisfied by the present experimental data. The measurement of semi-inclusive cross sections that may clarify the issue on d/u ratio is suggested. DOE

**N83-18440#** California Univ., Livermore. Lawrence Livermore Lab.
**PRESSURE LIMITS OF NEGATIVE ION SOURCES BASED UPON GAS EFFICIENCY AND EXTRACTED ION-CURRENT DENSITY**
Joel H. Fink (Westinghouse Electric Co.) 10 Mar. 1982 16 p refs
(Contract W-7405-eng-48)
(DE82-009302; UCID-19334) Avail: NTIS HC A02/MF A01

The nature of the electrical discharge has an obvious impact upon the gas efficiency of an ion source and on the current density which can be drawn from it. However external factors, such as the conductance of the grids and the background pressure along the beamline also have an effect. Simple approximations based upon these factors show that there is a lower limit to the pressure of an ion source, which can deliver an ion beam of given current density at a specific gas efficiency. Estimates of ion stripping losses in a double gridded structure show that for all practical purposes, there is an upper limit as well. DOE

**N83-18441#** Oak Ridge National Lab., Tenn. Fusion Energy Div.
**MAGNETIC-FIELD-DISTRIBUTION EFFECTS ON DIRECT RECOVERY EFFICIENCY**
J. H. Whealton and J. W. Wooten Apr. 1982 62 p refs
(Contract W-7405-eng-26)
(DE82-009601; ORNL/TM-8122) Avail: NTIS HC A04/MF A01

The ion recovery efficiency of a transverse magnetic field monochromatic direct recovery device intended for intense neutral beams is examined theoretically by solving a Poisson-Vlasov equation for an upper and lower bound representation of the neutralizer plasma. The variation of recovery efficiency with magnetic field distribution, excess ion velocity, beam perveance, and target plasma properties is considered. DOE

**N83-18442#** California Univ., Berkeley. Lawrence Berkeley Lab. Physics, Computer Science and Mathematics Div.
**GLUON BREMSTRAHLUNG EFFECTS IN LARGE P/SUB PERPENDICULAR/HADRON-HADRON SCATTERING**
G. C. Fox (California Inst. of Technology) and R. L. Kelly Feb. 1982 36 p refs Presented at the Forward Collider Workshop, Madison, Wisc., 10-12 Dec. 1981
(Contracts W-7405-eng-48; DE-AC03-81ER-40050)
(DE82-008871; LBL-13985; CONF-811231-3) Avail: NTIS HC A03/MF A01

Effects of parton (primarily gluon) bremstrahlung in the initial and final states of high transverse momentum hadron-hadron scattering are considered. Monte Carlo calculations based on conventional QCD parton branching and scattering processes are presented. The calculations are carried only to the parton level in the final state. The model is applied to the Drell-Yan process and to high transverse momentum hadron-hadron scattering triggered with a large aperture calorimeter. It is shown that the latter triggers are biased in that they select events with unusually large bremstrahlung effects. It is also shown that this trigger bias explains the large cross section and noncoplanar events observed in the NA5 experiment at the SPS. DOE

**N83-18443#** Los Alamos Scientific Lab., N. Mex.
**FAST AND SLOW FISSION**
H. C. Britt and A. Gavron 1981 17 p refs Presented at the Intern. Symp. on Nucl. Fusion and Related Collective Phenomena, Bad Honnef, West Germany, 26-29 Oct. 1981
(Contract W-7405-eng-36)
(DE82-008129; LA-UR-82-318; CONF-8110165-1) Avail: NTIS HC A02/MF A01

Measurements of alpha particle induced fission of actinide nuclei and fission of the composite system. Yb170 formed in C12 and Ne20 bombardments both show significantly greater neutron emission prior to fission than is consistent with current statistical models. Implications of these results are discussed in the context of possible extreme models: (1) the enhancement of fission at low excitation energies due to shell effects; (2) the inhibition of fission at high excitations due to a limiting of the fission width; and (3) the possibility of significant neutron emission during the descent from saddle to scission. In addition the apparent incompatibility between current models of incomplete fusion processes and the analysis of light heavy ion induced fission which ignore incomplete fusion is discussed. DOE

**N83-18444#** Oak Ridge National Lab., Tenn. Physics Div.
**ELECTRON-ION COLLISIONS**
D. H. Crandall Sep. 1982 59 p refs Presented at the NATO Adv. Study Summer Inst. on the Atomic Phys. of Highly Ionized Atoms, Cargese, Corsica, 7-18 Jun. 1982
(Contract W-7405-eng-26)
(DE83-000421; ORNL/TM-8453) Avail: NTIS HC A04/MF A01

Basic physics aspects of inelastic processes of excitation, ionization, and recombination that occur during electron-ion collisions are discussed. Multicharged ions with some emphasis of unique physics aspects associated with ionic charge are examined. Attention is paid to electron-ion interacting beams experiments. A number of papers which related directly to the present topic are alluded. Specific parts of the present topic can be relied on for some details are reviewed. DOE

**N83-18445#** California Univ., Berkeley. Lawrence Berkeley Lab. Nuclear Science Div.
**THE SOGGY SADDLE THEORY OF FISSION**
L. G. Moretto and G. Guarino Jan. 1982 4 p Presented at the Intern. Workshop on Gross Properties of Nuclei and Nucl. Excitation, Kleinwalsertal, Austria, 18 Jan. 1982
(Contract W-7405-eng-48)
(DE82-007750; LBL-13880; CONF-820120-2) Avail: NTIS HC A02/MF A01

The transition state theory of fission is generalized to allow for trajectories that return from saddle to compound nucleus. DOE

**N83-18446#** Indiana Univ., Bloomington.
**INTERNATIONAL CONFERENCE ON PHONON PHYSICS Final Technical Report, 15 Dec. 1980 - 28 Feb. 1982**
W. E. Bron 15 Mar. 1982 19 p Conf. held in Bloomington, Ind., 30 Aug. 1981
(Contract DE-AC02-81ER-10801)
(DE82-011953; DOE/ER-10801-1; CONF-810872-Summ) Avail: NTIS HC A02/MF A01

An International conference on Phonon Physics was held at Indiana University in Bloomington, Indiana from August 31 through September 3, 1981. Topics discussed and a list of participants at the conference are given. L.F.M.

# 73 NUCLEAR AND HIGH-ENERGY PHYSICS

Includes elementary and nuclear particles; and reactor theory.

For space radiation see *93 Space Radiation.*

**N83-18447#** Pacific Northwest Lab., Richland, Wash.
**EFFECT OF ORGANIC COMPLEXANTS ON THE MOBILITY OF LOW LEVEL WASTE RADIONUCLIDES IN SOILS**
J. L. Swanson Oct. 1981 12 p Presented at the 3rd Ann. Participants Inform. Meeting DOE Low-Level Waste Managament Program (LLWMP), New Orleans, 4-6 Nov. 1981
(Contract DE-AC06-76RL-01830)
(DE82-005839; PNL-SA-10019; CONF-811130-16) Avail: NTIS HC A02/MF A01

The effect of organic complexants, EDTA and DTPA, on the equilibrium sorption properties of europium, cesium strontium, cobalt and nickel on Hanford soils were investigated. All work was performed in the presence of air. Humic acid which is also a complexant occurs in some soils. The goal of the work was to obtain data that are at equilibrium so that the results would be meaningful in a thermodynamic sense. This goal was met with europium, cesium and strontium, but was not possible with cobalt and nickel where slow kinetics prevented equilibrium data from being obtained. DOE

**N83-18448#** California Univ., Livermore. Lawrence Livermore Lab. Nuclear Chemistry Div.
**FISSION: A COMPUTER CODE FOR CALCULATING FISSION YIELDS AND DELAYED-NEUTRON YIELDS USING THE MODEL PROPOSED BY WALDO**
D. F. Kusnezov and E. A. Henry Nov. 1981 45 p refs
(Contract W-7405-eng-48)
(DE82-006181; UCID-19263) Avail: NTIS HC A03/MF A01

Of the many available models that describe fission yields, the one proposed by R. Waldo seems to best reproduce the total delayed neutron yeilds obtained in fission by thermal or fission spectrum neutrons. A computer code was written to calculate fission product yields and beta-delayed neutron yields using his model. A description of the model is given. A comparison of calculated fission product yields to experimental yields as well as

calculations using other models for both 235U(n/sub t/,f) and 239Pu(n/sub t/,f) is included. DOE

**N83-18449#** Los Alamos Scientific Lab., N. Mex.
**NUCLEAR SAFEGUARDS RESEARCH AND DEVELOPMENT Program Status Report, Oct. 1980 - Jan. 1981**
C. N. Henry, comp. Nov. 1981 81 p refs
(Contract W-7405-eng-36)
(DE82-007014; LA-8870-PR) Avail: NTIS HC A05/MF A01

The status of a nuclear safeguard research and development program is presented. Topics include nondestructive assay technology development and applications, international safeguards, training courses, technology transfer, analytical chemistry methods for fissionable materials safeguards, the Department of Energy Computer Security Technical Center, and operational security. DOE

**N83-18450#** Pacific Northwest Lab., Richland, Wash.
**PACKAGE RECEIPT ASSAY SYSTEMS**
R. L. Brodzinski Nov. 1981 7 p Presented at the 3rd Ann. DOE Participants Inform. Meeting on Low-Level Waste Management, New Orleans, 4 Nov. 1981
(Contract DE-AC06-76RL-01830)
(DE82-005781; PNL-SA-10022; CONF-81130-15) Avail: NTIS HC A02/MF A01

Relevant radioactive waste package parameters are identified. Waste package measurement requirements and capabilities are evaluated and prioritized. A passive TRU package assayer is described. DOE

**N83-18451#** Korea Advanced Energy Research Inst., Seoul.
**SURVEY OF NUCLEAR FUSION TECHNOLOGY. A PROSPECT ANALYSIS OF TOKAMAK FUSION RESEARCH**
W. K. Hwang 1981 74 p refs In KOREAN; ENGLISH summary
(DE82-700131; KAERI/RR-275/80) Avail: NTIS (US Sales Only) HC A04/MF A01; DOE Depository Libraries

The fusion research evaluation model for analyzing various R and D sinarios, the trend analysis of Tokamak research, and the near-term technologies are discussed. A computer code, FUSREV, was developed. It consists of the plasma power model and the cost/benefit model. Since the state-of-the-arts which are expected to be achieve as the result of subproject R and D's can only be obtained in the form of probability distribution functions Monte Carlo method is employed. The test computation of the code shows acceptable results. However, FUSREV was continuously modified employing new models for both technology and economics. DOE

**N83-18452#** Mound Lab., Miamisburg, Ohio.
**PELLETIZED WASTE FORM DEMONSTRATION PROGRAM: APRIL - SEPTEMBER 1981**
Edward L. Lewis and Robert F. Herbert, Jr. 22 Dec. 1981 25 p ref
(Contract DE-AC04-76DP-00053)
(DE82-005692; MLM-2877) Avail: NTIS HC A02/MF A01

After 27 months of leachability testing, data indicated that PuO2 spiked 65 wt % ash/35 wt % cement pellets and 50 wt % sludge/50 wt % cement pellets have greater leach rates at 70 C than at ambient temperatures (approximately 22 C). The leach rate of the sludge cement pellets at 70 C steadily increases since reaching a minimum at about three months. The hot demonstration of the production waste pelletization line (PWPL) delayed by calcination difficulties, which were corrected. An experimental study of the effect of ash carbon percentage on pellet compressive strength indicates that low carbon percentage is necessary for a high strength product. The Mound Acceptance Criteria for pellet compressive strength was changed to > or = 2500 psi (L/D = 0.75 and seven-day dry cure). A system report is included and contains photographs of the PWPL, operational procedures, and other applicable data. DOE

**N83-18453#** Rockwell International Corp., Golden, Colo.
**INTERNATIONAL ACTIVITIES IN CHEMICAL THERMODYNAMICS OF NUCLEAR MATERIALS**
J. D. Navratil, F. L. Oetting, and P. A. G. OHare 1982 9 p Presented at the 183rd Am. Chem. Soc. Ann. Meeting, Las Vegas, Nev., 27 Mar. 1982
(Contract DE-AC04-76DP-03533)
(DE82-005634; RFP-3286; CONF-820304-12) Avail: NTIS HC A02/MF A01

For over twenty years, the International Atomic Energy Agency has played a major role in furthering the exchange of information on the thermodynamics of nuclear materials between scientists all over the world. The methodology used by the Agency to achieve this exchange has been to convene five international symposia on the thermodynamics of nuclear materials (1962, 1965, 1967, 1974 and 1979). These symposia not only served as a means for scientific exchange of experimental results, but also provided a mechanism whereby various scientists could collaborate on pertinent topics. Under the sponsorship of the Agency, several panels have been held resulting in the publication of several technical reports specifically related to thermochemical assessment, e.g. UC and PuC (1962), UO2 (1964), and PuO2 and UPuO2 (1964). On a broader front, publication of two series of monographs on thermodynamic assessment has recently been undertaken; one consists of a special series of the Atomic Energy Review and the other is a series on The Chemical Thermodynamics of Actinide Elements and Compounds. DOE

**N83-18454#** Brookhaven National Lab., Upton, N. Y.
**NEW MAGNET POLE SHAPE FOR ISOCHRONOUS CYCLOTRONS**
C. E. Thorn, C. Chasman, and A. J. Baltz 1981 4 p refs Presented at the Particle Accelerator Conf., Washington, 11-13 Mar. 1981
(Contract DE-AC02-76CH-00016)
(DE82-006934; BNL-29200; CONF-810314-173) Avail: NTIS HC A02/MF A01

A new design was developed for shaping pole tips to produce the radially increasing fields required for isochronous cyclotrons. The conventional solid hill poles are replaced by poles mounted over a small secondary gap which tapers radially from maximum at the magnet edge to zero near the center. Field measurements with a model magnet and calculations with the code TRIM show an increase in field at the edge of the magnet without the usual corresponding large increase in fringing, and a radial field shape more nearly field independent than for conventional hills. The flying hills have several advantages for variable energy multiparticle cyclotrons: (1) a large reduction in the power dissipated by isochronizing rim coils; (2) a more constant shape and magnitude flutter factor, eliminating flutter coils and increasing the operating range; and (3) a sharper fall off of the fringe field, simplifying beam extraction. DOE

**N83-18455#** Los Alamos Scientific Lab., N. Mex.
**RADIO FREQUENCY HEATING OF CERAMIC WINDOWS IN FUSION APPLICATIONS**
John D. Fowler, Jr. Nov. 1981 43 p refs
(Contract W-7405-eng-36)
(DE82-010974; LA-9088-MS) Avail: NTIS HC A03/MF A01

Ceramic windows will be used as material barriers for radio frequency plasma heating in fusion reactors. This report examines the theory behind RF heating phenomena. Heating calculations are presented for various window materials, thicknesses, wavelengths, and power densities. The most pertinent material properties are loss tangent, thermal conductivity, dielectric constant, strength, and radiation resistance. Calculations indicate that among candidate materials, beryllium oxide offers the most promise because of its large thermal conductivity and relatively low loss tangent and dielectric constant. On the other hand, beryllia is susceptible to neutron damage, and this may adversely affect its electrical properties. Another promising candidate is sapphire, particularly at lower temperatures where the thermal conductivity is high. Fused silica suffers from low thermal conductivity and large positive temperature coefficient for loss tangent, but it may be useful under some conditions. DOE

**N83-18456#** Brookhaven National Lab., Upton, N. Y.
**DETECTORS AND SIGNAL PROCESSING FOR HIGH-ENERGY PHYSICS**
P. Rehak 1981 103 p refs Presented at the 3rd Course of Intern. School of Phys., Lake Como, Italy, 28 Jul. - 1 Aug. 1981
(Contract DE-AC02-76CH-00016)
(DE82-010252; BNL-30214; CONF-810787-1) Avail: NTIS HC A06/MF A01

Basic principles of the particle detection and signal processing for high energy physics experiments are presented. It is shown that the optimum performance of a properly designed detector system is not limited by incidental imperfections, but solely by more fundamental limitations imposed by the quantum nature and statistical behavior of matter. The noise sources connected with the detection filtering and optimal detector/amplifying device matching are introduced. Signal processing for a liquid argon calorimeter is analyzed in some detail. The position detection in gas counters is studied. Resolution in drift chambers for the drift coordinate measurement as well as the second coordinate measurement is discussed. DOE

**N83-18457#** Los Alamos Scientific Lab., N. Mex.
**HIGH FREQUENCY ENERGY MEASUREMENTS**
S. C. Stotlar 1981 8 p refs Presented at the Electro-Opt./Laser Conf., Anaheim, Calif. 17-19 Nov. 1981
(Contract W-7405-eng-36)
(DE82-006103; LA-UR-81-3604; CONF-811164-2) Avail: NTIS HC A02/MF A01

High frequency (> 100 MHz) energy measurements present special problems to the experimenter. Environment or available electronics often limit the applicability of a given detector type. The physical properties of many detectors are frequency dependent and in some cases, the physical effect employed can be frequency dependent. State-of-the-art measurements generally involve a detection scheme in association with high-speed electronics and a method of data recording. Events can be single or repetitive shot requiring real time, sampling, or digitizing data recording. Potential modification of the pulse by the detector and the associated electronics are important. Typical applications, methods of choosing a detector, and high speed detectors are reviewed. Special considerations and limitations of some applications and devices are described. DOE

**N83-18458#** Brookhaven National Lab., Upton, N. Y. Dept. of Nuclear Energy.
**NUCLEAR-WASTE-MANAGEMENT TECHNICAL SUPPORT IN THE DEVELOPMENT OF NUCLEAR-WASTE-FORM CRITERIA FOR THE NRC. TASK 2. ALTERNATIVE TRU TECHNOLOGIES**
G. Bida and D. R. MacKenzie Feb. 1982 227 p refs Sponsored in part by the Nuclear Regulatory Commission 4 Vol.
(Contract DE-AC02-76CH-00016)
(DE82-009882; NUREG/CR-2333-Vol-2;
BNL-NUREG-51458-Vol-2) Avail: NTIS HC A11/MF A01

Three main areas of transuranic (TRU) waste management are addressed: immobilization processes and waste forms for ultimate geologic disposal of TRU waste; decontamination as a method for TRU waste management; and potential problems associated with gas generation by certain TRU wastes. Waste forms are considered in terms of the regulations and criteria proposed in 10 CFR 60. Decontamination methods are addressed with regard to their ability to remove contamination to a level below the 10 nCi/g TRU limit. Other important factors are the volume reduction achieved, and compatibility of the secondary waste streams with acceptable waste forms. Gas generation by combustible TRU wastes and cast concretes containing TRU isotopes is discussed, and its potential for damage to a geologic repository is considered. Exclusion of combustible TRU waste from repositories is recommended. DOE

**N83-18459#** Brookhaven National Lab., Upton, N. Y. Dept. of Nuclear Energy.
**NUCLEAR-WASTE-MANAGEMENT TECHNICAL SUPPORT IN THE DEVELOPMENT OF NUCLEAR-WASTE-FORM CRITERIA FOR THE NRC**
Debu Majumdar, Joseph P. Indusi, and H. K. Manaktala Feb. 1982 267 p refs Sponsored in part by the Nuclear Regulatory Commission 4 Vol.
(Contract DE-AC02-76CH-00016)
(DE82-009883; NUREG/CR-2333-Vol-3;
BNL-NUREG-51458-Vol-3) Avail: NTIS HC A12/MF A01

The quantity and characteristics of existing and projected high level waste and transuranic waste from the government nuclear programs, the existing high level waste and transuranic waste from the commercial power industry, and the existing and projected spent fuel from the commercial nuclear power industry are described. DOE

**N83-18460#** Brookhaven National Lab., Upton, N. Y. Dept. of Nuclear Energy.
**NUCLEAR WASTE MANAGEMENT TECHNICAL SUPPORT IN THE DEVELOPMENT OF NUCLEAR WASTE FORM CRITERIA FOR THE NRC. TASK 4. TEST DEVELOPMENT REVIEW**
T. M. Ahn, K. S. Czyscinski, E. M. Franz, C. J. Klamut, B. S. Lee, N. S. McIntyre, K. J. Swyler, and R. J. Wilke Feb. 1982 193 p refs Sponsored in part by the Nuclear Regulatory Commission 4 Vol.
(Contract DE-AC02-76CH-00016)
(DE82-009884; NUREG/CR-2333-Vol-4;
BNL-NUREG-51458-Vol-4) Avail: NTIS HC A09/MF A01

Testing methods for a high level nuclear waste package serve several purposes: quality control of the materials being used, comparative testing of alternative components, and eventual qualification of the waste package to comply with Nuclear Regulatory Commission criteria in 10 CFR 60. Testing of the waste form is considered in terms of chemically induced changes (leaching), mechanical effects and radiation effects. The waste container testing involves corrosion investigation, mechanical testing and studies of radiation effects. Testing of geologic backfill is discussed with the emphasis placed on the use of dynamic approaches to determine radionuclide migration. Backfill is chiefly investigated for its ability to retain radionuclides under different aqueous flow conditions. Finally, the different objectives for whole package testing are reviewed and compared to recent experiments started in DOE laboratories. DOE

**N83-18461#** Babcock and Wilcox Co., Lynchburg, Va. Research and Development Div.
**CRITICAL EXPERIMENTS SUPPORTING UNDERWATER STORAGE OF TIGHTLY PACKED CONFIGURATIONS OF SPENT FUEL PINS Summary Report**
G. S. Hoovler, M. N. Baldwin, E. L. Maceda, and F. G. Welfare Nov. 1981 45 p refs
(Contract DE-AC09-79ET-47923)
(DE82-010848; BAW-1645-4) Avail: NTIS HC A03/MF A01

Critical experiments were performed with low enriched UO2 arrays simulating underwater pin storage of spent pressurized water reactor fuel. Pin storage refers to a storage concept in which fuel assemblies are dismantled and the individual fuel pins from several assemblies are tightly packed into specially designed cannisters. Each critical configuration is sufficiently described and documented to permit the use of these data for validating critically calculational methods according to ANSI Standard N16.9-1975. The reactivity of each benchmark core was calculated using the AMPX-KENO IV package. The results of these analyses are also presented. DOE

**N83-18462#** Bhabha Atomic Research Centre, Bombay (India). Waste Management Div.
**STANDARDISATION OF TECHNIQUES FOR EVALUATION OF SOLIDIFIED HIGH LEVEL WASTE PRODUCT: A STATUS REPORT**
R. C. Rastogi, ed. 1981 72 p refs
(DE82-700881; BARC-1099) Avail: NTIS (US Sales Only) HC A04/MF A01; DOE Depository Libraries

The results of studies on: (1) development of suitable glass

compositions for solidification and vitrification of high level radioactive wastes, and (2) the characteristics of these compositions, namely, leaching, mechanical properties, thermal conductivity, voscosity and homogeneity evaluation are reported. Inactive simulated purex waste was used for compositions reported herein. The data generated on leaching and other product characteristics of the selected vitrified waste products was used to evaluate the performance of corresponding experimental units and techniques with respect to their reproducibility and reliability. DOE

**N83-18463#** Du Pont de Nemours (E. I.) and Co., Aiken, S.C. Savannah River Lab.
**AT-REACTOR STORAGE CONCEPTS CRITERIA FOR PRELIMINARY ASSESSMENT**
L. A. Boydston Dec. 1982 27 p refs
(Contract DE-AC09-76SR-00001)
(DE82-008187; DPSP-AFR-81-6-2) Avail: NTIS HC A03/MF A01

The licensing, safety, and environmental considerations of four wet and four dry at-reactor storage concepts are presented. Physical criteria for each concept are examined to determine the minimum site and facility requirements which must be met by a utility which desires to expand its at-reactor spent fuel storage capability. DOE

**N83-18464#** Sandia Labs., Albuquerque, N. Mex.
**EXPERIENCE IN TESTING OF A SOLUTION MINED STORAGE CAVERN**
K. L. Goin 1982 23 p Presented at the 61st Ann. Convention of the Gas Processors Assoc., Dallas, 15-17 Mar. 1982
(Contract DE-AC04-76DP-00789)
(DE82-011013; SAND-82-0522C; CONF-820323-1) Avail: NTIS HC A02/MF A01

Recertification tests were made of the strategic petroleum reserve oil storage cavern number. The cavern has a volume of 8,600,000 barrels. Tests included hydrostatic tests of the brine filled cavern and nitrogen leak tests of the three wells entering the cavern. Test procedures are described and test results are discussed. DOE

**N83-18465#** Department of Energy, Morgantown, W. Va.
**NEVADA NUCLEAR WASTE STORAGE INVESTIGATIONS Quarterly Report, Oct. - Dec. 1981**
Mar. 1982 74 p
(DE82-009496; NVO-196-29) Avail: NTIS HC A04/MF A01

Specific underground rock masses are investigated to determine if they are suitable for permanently disposing of highly radioactive wastes. The Nevada Test Site is evaluated as a suitable repository site, and the capability to safely handle and store commercial spent reactor fuel and high-level waste is developed. DOE

**N83-18466#** D'Appolonia (E.) Consulting Engineers, Inc., Albuquerque, N. Mex. Office of Nuclear Waste Isolation.
**SEALING CONSIDERATIONS FOR REPOSITORY SHAFTS IN BEDDED AND DOME SALT**
Columbus, Ohio Battelle Memorial Inst. Dec. 1981 150 p refs
(Contract DE-AC06-76RL-01830)
(DE82-010937; ONWI-255) Avail: NTIS HC A07/MF A01

The geologic and hydrologic data base is reviewed for penetration seal designs referenced to the Los Medanos bedded salt site in New Mexico and to four candidate salt domes in the Gulf Interior. Experience with existing shafts highlights the importance, for shaft decommissioning as well as operation, of achieving an adequate seal at and immediately below the top of salt. Possible constuction procedures for repository shafts are reviewed, noting advantages and disadvantages with respect to repository sealing. At this stage, there does not appear to be a clear preference for excavation by drill and blast or by drilling. If conventional drill and blast methods are used, it may be necessary to grout in permeable zones above the salt. An important consideration with respect to sealing is that grouting operations (or freezing should it be used) should not establish connections between the top of salt and waterbearing zones higher in the stratigraphic section. Generally, it is concluded that Los Medanos and the dome salt sites are favorable candidate repository sites from the point of view of sealing. DOE

**N83-18467#** Gilbert/Commonwealth, Reading, Pa.
**PROGRAM PLANNING FOR FUTURE IMPROVEMENT IN MANAGING ORNL'S RADIOACTIVE WASTES**
Jan. 1982 361 p refs
(Contract W-7405-eng-26)
(DE82-007721; ORNL/Sub-79/13837/7) Avail: NTIS HC A16/MF A01

This is intended to serve as a reference document and guide in developing the long-term improvements section of ORNL's radioactive waste management plan. The report reviews ORNL's operations and future program needs in terms of currently applicable DOE regulations and also in terms of regulations and accepted practices of the commercial sector of the nuclear power industry so that the impact of potential future adoption of these regulations and standards on ORNL's operations can be fully evaluated. The principal conclusion reached after reviewing ORNL's waste management operations is that these operations are currently being conducted in a manner that does not endanger the health or safety of workers or the general public and that does not have an adverse effect on the environment. Although nineteen specific problem areas have been identified all of these problems can be attributed to one of the following: (1) the legacy of past practices; (2): gradual deterioration of systems which have reached (or are near to reaching) the end of their reasonable design lives; and (3) potential changes in regulations applicable to ORNL. DOE

**N83-18468#** Pacific Northwest Lab., Richland, Wash.
**INTERNATIONAL ASPECTS OF THE MANAGEMENT OF LOW-LEVEL DUMPING OF RADIOACTIVE WASTES IN THE OCEANS**
W. L. Templeton Jan. 1982 15 p refs Presented at the Waste Management Conf., Tucson, Ariz., 8 Mar. 1982
(Contract DE-AC06-76RL-01830)
(DE82-008588; PNL-SA-10178; CONF-820303-14) Avail: NTIS HC A02/MF A01

International regulations governing radioactive waste disposal; radiologics principles as applied to disposal to the environment; historical dumping practices; assessment of the North East Atlantic dump site; IAEA generic studies; and national and international implications are discussed. Adequate international criteria and standards must be developed to assist the US in evaluating the option of using the oceans for the disposal of low-level radioactive wastes. International cooperation in research and radiological surveillance must be expanded. The delays in the agreements on international mechanisms, criteria and standard, sometimes as a direct result of a lack of coordinated US policies makes the implementation of the intent of the London Dumping Convention and the NEA mechanism more difficult. How the US should apply the London convention to the 200 mile exclusive economic zone is unresolved. DOE

**N83-18469#** Rockwell International Corp., Richland, Wash.
**BASALT WASTE ISOLATION PROJECT TECHNICAL PROGRAM EVALUATION PROCESS: A CRITERIA-BASED METHOD**
H. Babad, G. C. Evans, and B. A. Wolfe 1982 8 p refs Presented at the Waste Management Conf., Tucson, Ariz., 8 Mar. 1982
(Contract DE-AC06-77RL-01030)
(DE82-008000; RHO-BW-SA-207-P; CONF-820303-5) Avail: NTIS HC A02/MF A01

The need to objectively evaluate the progress being made by the Basalt Waste Isolation Project (BWIP) toward establishing the feasibility of siting a nuclear waste repository in basalt (NWRB) mandates a process for evaluating the technical work of the project. To assist BWIP management in the evaluation process, the Systems Department staff has developed a BWIP Technical Program Evaluation Process (TPEP). The basic process relates progress on project technical work to the SWIP Functional and System Performance Criteria as defined in National Waste Terminal Storage (MWTS) Criteria Documents. The benefits of the TPEP to

BWIP and future plans for TPEP are discussed. During fiscal year (FY) 1982, TPEP will be further formalized and further applied to the review of BWIP technical activities. DOE

**N83-18470#** Sandia Labs., Albuquerque, N. Mex.
**STATUS OF THE NEVADA NUCLEAR WASTE STORAGE INVESTIGATIONS**
R. C. Lincoln 1982 11 p Presented at the AIF Fuel Cycle Conf., New York, 21 Mar. 1982
(Contract DE-AC04-76DP-00789)
(DE82-009966; SAND-81-2121C; CONF-820346-1) Avail: NTIS HC A02/MF A01

The Nevada Nuclear Waste Storage Investigations (NNWSI) are part of the National Waste Terminal Storage (NWTS) program being conducted by the Department of Energy. Within the NWTS program, the NNWSI is the component that focuses on sitting evaluations on and near the Nevada Test Site (NTS). The objectives of the Nevada project include evaluating the suitability of a Test and Evaluation Facility (TEF) site on or near the NTS, evaluating the suitability of a commercial nuclear waste repository on or near the NTS, and supporting the NWTS program with research that is uniquely possible at NTS. Current engineering studies suggest that TEF and repository surface facilities would need to be located on gently sloping alluvium east of Yucca Mountain. Access from surface facilities to underground waste emplacement areas would be by vertical shafts and horizontal drifts, or possibly by inclined adits. The current NNWSI schedule includes an exploratory shaft location and horizon recommendation in 12/82, with a start of exploratory shaft drilling in 9/83. DOE

**N83-18471#** Sandia Labs., Albuquerque, N. Mex. Fuel Cycle Risk Analysis Div.
**ASSESSMENT OF TECHNICAL CRITERIA OF 10CFR60 FOR GEOLOGIC DISPOSAL OF HIGH-LEVEL WASTE**
M. S. Y. Chu, N. R. Ortiz, R. E. Pepping, and M. D. Siegel 1982 15 p refs Presented at the Waste Management Conf., Tucson, Ariz., 8 Mar. 1982
(Contract DE-AC04-76DP-00789)
(DE82-011948; SAND-82-0627C; CONF-820303-29) Avail: NTIS HC A02/MF A01

The US Nuclear Regulatory Commission (NRC) published a proposed rule (10CFR60) which specifies technical criteria for geologic disposal of high-level waste designed to facilitate compliance with the EPA draft standard (40CFR191). The effects of the 10CFR60 numerical technical criteria on reducing the risk and/or uncertainties associated with meeting the EPA draft standard was evaluated. The impacts of the following three numerical technical criteria were examined: (1) waste package containment of at least 1000 years; (2) control release rate of at most part/year from the underground facility; and (3) groundwater travel time of at least 1000 years to the accessible environment. A generic parametric analysis, a parametric analysis including geochemical retardation for basalt and a parametric analysis for a hypothetical basalt site were performed. DOE

**N83-18472#** Rockwell International Corp., Golden, Colo. Energy Systems Group.
**OPTIMIZATION AND CHARACTERIZATION OF A CEMENTED ULTIMATE-STORAGE PRODUCT**
H. Brunner Dec. 1981 18 p refs Transl. into ENGLISH of NUKEM Interim Report, 1 Feb. - 31 Aug. 1981, 24 Sep. 1981 18 p
(Contract DE-AC04-76DP-03533)
(DE82-005739; RFP-Trans-310) Avail: NTIS HC A02/MF A01

The U- and Pu-containing packaging wastes can be homogeneously cemented after a washing and fragmentation process. Both finely crushed and coarsely fragmented raw wastes yield products with sufficient mechanical stability. The processability limit of the coarsely fragmented raw waste using cement paste or mortar is largely determined by the cellulose content, which is not to exceed 1.3% by weight in the end waste. Of 9 binders studied, the most corrosion-resistant products were obtained with blast-furnace slag cement, whereas poured concrete and Maxit are much less resistant in five-component brine. In the cemented product, hydrolysis of plasticizers (DOP) from plastics (PVC) occurs, leading to release of 2-ethyl-hexanol. This reaction occurs to a much lower degree with blast-furnace slag cement than with all other binders studied. The binder chosen for further tests consists of blast-furnace slag cement, concrete fluidizer and a stabilizer, and is processed at a W/C ratio of 0.43. DOE

**N83-18473#** California Univ., Berkeley. Lawrence Berkeley Lab. Earth Sciences Div.
**RADIOACTIVE WASTE DISPOSAL IN GRANITE**
Paul A. Witherspoon and David J. Watkins Feb. 1982 5 p refs Presented at the Am. Soc. of Civil. Engs. Conf., Las Vegas, Nev., 26-30 Apr. 1982
(Contract DE-AC03-76SF-00098)
(DE82-008873; LBL-14082; CONF-820422-2) Avail: NTIS HC A02/MF A01

The principal geotechnical problems in selecting a repository site for radioactive waste disposal in granite are to evaluate the suitability of the rock mass in terms of: (1) fracture characteristics, (2) thermomechanical effects, and (3) fracture hydrology. Underground experiments in a mine in Sweden have provided an opportunity to study these problems. The research has demonstrated the importance of hydrogeology and the need to improve predictions of the thermomechanical behavior of fractured rocks. To characterize a site, measurements made from the surface must be supplemented by extensive subsurface experiments. Much effort is needed to generate the technology required for the development of waste repositories. DOE

**N83-18474#** Los Alamos Scientific Lab., N. Mex. Environmental Science Group.
**USE OF A STATE-OF-THE-ART MODEL IN GENERIC DESIGNS OF SHALLOW LAND REPOSITORIES FOR LOW-LEVEL WASTES**
John W. Nyhan and Leonard J. Lane 1982 11 p refs Presented at the Waste Management Conf., Tucson, Ariz., 8-11 Mar. 1982
(Contract W-7405-eng-36)
(DE82-008117; LA-UR-82-378; CONF-820303-16) Avail: NTIS HC A02/MF A01

A state of the art model is described for simulating hydrologic and soil erosion processes at shallow land waste disposal sites. Applications of the model in waste site selection and in the management of waste disposal sites are discussed relative to minimizing soil erosion of trench caps and percolation of soil water through trench caps into underlying buried wastes. DOE

**N83-18475#** Battelle Memorial Inst., Columbus, Ohio. Office of the National Terminal Storage Integration.
**THE 1981 NATIONAL WASTE TERMINAL STORAGE PROGRAM INFORMATION MEETING**
Nov. 1981 348 p refs Proceedings of meeting held in Columbus, Ohio, 17-19 Nov. 1981
(Contract DE-AC06-76RL-01830)
(DE82-010733; DOE/NWTS-15; CONF-811119) Avail: NTIS HC A15/MF A01

Topics covered include: overview of the national waste terminal storage (NWTS) program; site characterization; repository development; regulatory framework; systems; socioeconomic evaluation; site screening/characterization support activities; repository data base development; regulatory implementation; systems performance assessment; sociopolitical initiatives; Earth sciences; international waste management; waste package development; quality assurance; and Overviews of NWTS Projects. DOE

**N83-18476#** Exxon Nuclear Idaho Co., Inc., Idaho Falls.
**FINAL SAFETY ANALYSIS REPORT FOR THE FIFTH CALCINED SOLIDS STORAGE FACILITY Final Report**
Jan. 1982 87 p refs
(Contract DE-AC07-79ID-01675)
(DE82-007531; ENICO-1068) Avail: NTIS HC A05/MF A01

Radioactive aqueous wastes generated by the solvent extraction of uranium from expended fuels at ICPP will be calcined in

the New Waste Calcining Facility (NWCF). The calcined solids are pneumatically transferred to stainless steel bins enclosed in concrete vaults for interim storage of up to 500 years. The Fifth Calcined Solids Storage Facility (CSSF) provides 1000 cu m of storage and consists of seven annular stainless steel bins inside a reinforced concrete vault set on bedrock. Storage of calcined solids is essentially a passive operation with very little opportunity for release of radionuclides and with no potential for criticality. There will be no potential for fire or explosion. Shielding has been designed to assure that the radiation levels at the vault exterior surfaces will be limited to less than 0.5 mRem/h. A sump in the vault floor will collect any in-leakage that may occur. Any water that collects in the sump will be sampled then removed with the sump jet. There will be an extremely small chance of release of radioactive particulates into the atmosphere as a result of a bin leak. The Design Basis Accident (DBA) postulates the spill of solids from an eroded fill line into the vault coupled with a failure of the vault cooling air radiation monitor. DOE

**N83-18477#** California Univ., Livermore. Lawrence Livermore Lab.
**THE ENERGY SPECTRUM OF NEUTRALS FORMED IN AN ION ACCELERATOR**
Joel H. Fink 15 Mar. 1982 20 p refs
(Contract W-7405-eng-48)
(DE82-009722; UCID-19338) Avail: NTIS HC A02/MF A01

The energy distribution of the neutrals formed in the ion beam accelerator are estimated. To determine the fraction of those neutrals which leave the neutral beam injector and go on into the reactor, more details of the beam line performance are needed. DOE

**N83-18478#** Du Pont de Nemours (E. I.) and Co., Aiken, S.C.
**NATIONAL LONG-TERM HIGH-LEVEL WASTE-TECHNOLOGY PROGRAM**
Peter L. Gray 1981 12 p refs Presented at the ANS Winter Meeting, San Francisco, 29 Nov. - 4 Dec. 1981
(Contract DE-AC09-76SR-00001)
(DE82-008186; DP-MS-81-57; CONF-811103-120) Avail: NTIS HC A02/MF A01

The national program for long-term management of high level waste (HLW) from nuclear fuels reprocessing is discussed. This covers only DOE defense wastes. Current emphasis is on solidification of waste into a form that, along with additional barriers, may be permanently stored in a repository. An integrated national plan incorporates all the elements of such an overall HLW disposal system. Interim storage is in near-surface tanks at the Hanford and Savannah River sites. At the Idaho site, waste is stored in bins after being calcined. Some Idaho waste is liquid and is also stored in tanks before calcination. Retrieval and immobilization of HLW into a solid, low-release form represent the major elements for which our long-term program has responsibility. Once solidified, the waste will temporarily remain onsite until the final disposal site is prepared for receipt of waste. Currently, a geologic repository is favored for ultimate disposal, although other possibilities such as seabed, icecap, space, and near-surface disposal are also being considered. DOE

**N83-18479#** Kansas Univ., Lawrence.
**FUSION MEASUREMENTS IN LIGHT- AND MEDIUM-MASS HEAVY-ION REACTIONS Progress Report, 1 Jun. 1981 - 31 May 1982**
F. W. Prosser Jan. 1982 45 p refs
(Contract DE-AS02-79ER-10420)
(DE82-007975; DOE/ER-10420/3) Avail: NTIS HC A03/MF A01

Collaborations in heavy-ion experiments at Argonne continued and a new collaboration at Notre Dame was initiated. Analysis of gamma ray data obtained at Argonna for the fusion of 16 180 + 24 26Mg was almost completed. Preliminary reports were given in November, 1981, and papers are being prepared. Experiments with beams of 4 2S and 58Ni on targets from isotopes of Sn to 170Yb were made for the cross sections for fusion-evaporation and fusion-fission processes. At Notre Dame, a series of experiments to determine the entry line properties of residues from the fusion of 160 + 12C were undertaken. Progress is reported. DOE

**N83-18480#** Los Alamos Scientific Lab., N. Mex.
**RESEARCH AND DEVELOPMENT RELATED TO THE NEVADA NUCLEAR WASTE STORAGE INVESTIGATIONS Progress Report, 1 Apr. - 30 Jun. 1981**
B. R. Erdal, comp., W. R. Daniels, comp., D. T. Vaniman, comp., and K. Wolfsberg, comp. Oct. 1981 71 p refs
(Contract W-7405-eng-36)
(DE82-010987; LA-8959-PR) Avail: NTIS HC A04/MF A01

Progress on the following tasks are presented: waste package development; nuclide migration experiments in G tunnel-laboratory studies; geochemistry of tuff; mineralogy-petrology of tuff; volcanic hazard investigations; site evaluation; rock physics studies; exploratory shaft design; and quality assurance. DOE

**N83-18481#** Los Alamos Scientific Lab., N. Mex. Waste Management Group.
**DESIGN AND OPERATION OF A LOW-LEVEL SOLID-WASTE DISPOSAL SITE AT LOS ALAMOS**
K. A. Balo, N. E. Wilson, and J. L. Warren 1982 22 p refs Presented at the Waste Management Conf., Tucson, Ariz., 8 Mar. 1982
(Contract W-7405-eng-36)
(DE82-008120; LA-UR-82-371; CONF-820303-11) Avail: NTIS HC A02/MF A01

Approximately 185000 cu m of low level and transuranic radioactive solid waste, were disposed of by onsite shallow land burial. Procedures and facilities were designed and evaluated in the areas of waste acceptance, treatment and storage, disposal, traffic control, and support systems. The methodologies assuring the proper management and disposal of radioactive solid waste are summarized. DOE

**N83-18482#** Oak Ridge National Lab., Tenn. Health and Safety Research Div.
**UNCERTAINTIES ASSOCIATED WITH GEOLOGIC DISPOSAL OF HIGH-LEVEL RADIOACTIVE WASTE**
D. C. Kocher, A. L. Sjoreen, C. S. Bard, and C. R. Olsen 1982 20 p refs Presented at the Waste Management Conf., Tucson, Ariz., 8 Mar. 1982
(Contract W-7405-eng-26)
(DE82-008810; CONF-820303-27) Avail: NTIS HC A02/MF A01

Uncertainties associated with models for predicting: (1) underwater transport of radionuclides between a repository and the biosphere; and (2) long term collective dose and health effects following release of long lived radionuclides to the biosphere are discussed. The various sources of uncertainty are emphasized, and the extent to which current models and supportin data bases can realistically describe long term repository performance and health risks are evaluated. DOE

**N83-18483#** Sandia Labs., Albuquerque, N. Mex.
**STATUS OF NNWSI AREA-TO-LOCATION SCREENING ACTIVITIES**
S. Sinnock and J. A. Fernandez 1981 21 p refs Presented at the NWTS Program Inform. Meeting, Columbus, Ohio, 17 Nov. 1981
(Contract DE-AC04-76DP-00789)
(DE81-030684; SAND-81-2042C; CONF-811119-4) Avail: NTIS HC A02/MF A01

A systems approach for screening the Nevada Research and Development Area of the Nevada Test Site and contiguous lands in Nye County, Nevada for potential geologic repository locations is being implemented by Sandia National Laboratories (SNL), Technical Overview Contractor to the Department of Energy's Nevada Nuclear Waste Storage Investigations (NNWSI). The results of the formal screening method will be reviewed by the NNWSI Site Evaluation Working Group and Steering Committee and recommendations forwarded to the manager of DOE's Nevada Operations Office for a decision on preferred repository locations in the spring of 1982. Basic geologic, hydrologic, engineering, and

environmental data compatible with the requirements of the screening method have been provided to Sandia Technical Overview by other NNWSI project participants from Sandia National Laboratories, Los Alamos National Laboratory, Lawrence Livermore National Laboratory, the US Geological Survey, and others. DOE

# 74 OPTICS

Includes light phenomena.

**N83-18484*#** Virginia Univ., Charlottesville. Dept. of Electrical Engineering.
**INVESTIGATION OF SEMICONDUCTOR CLAD OPTICAL WAVEGUIDES Annual Status Report, 31 Jul. 1981 - 1 Aug. 1982**
T. E. Batchman and G. M. McWright 1 Aug. 1982 76 p refs
(Grant NAG1-177)
(NASA-CR-169856; NAS 1.26:169856; UVA/528207/EE82) Avail: NTIS HC A05/MF A01 CSCL 20F

Glass waveguides are studied because of the ease and economy of fabricating devices in glass. All calculations are based on the assumption of a glass guide and substrate, but the effects being studied will occur on other materials if the proper refractive indices are used in the calculations. S.L.

**N83-18485*#** National Aeronautics and Space Administration. Pasadena Office, Calif.
**OPTICAL FIBER TACTILE SENSOR Patent Application**
Antal K. Bejczy, inventor (to NASA) (JPL, California Inst. of Tech., Pasadena) Filed 25 Nov. 1980 16 p Sponsored by NASA
(NASA-Case-NPO-15375-1; US-Patent-Appl-SN-210405) Avail: NTIS HC A02/MF A01 CSCL 20F

A tactile sensor with optical fibers is described. The novel sensor includes a plurality of cells. Each cell is formed as an open cavity in a solid material. The cell is closed off by an elastic membrane. A pair of light conductors preferrably optical fibers transient light into the cell and conduct reflected light from the cell. Distortion in the elastic membrane due to contact with an object charges the amount of reflected light, thereby indicating contact with the sensor. The novelty of the invention is believed to reside in the use of light with optical fibers to provide tactile information of high resolution with minimal interference from external electrical magnetic fields. NASA

**N83-18486#** Liege Univ. (Belgium). Inst. d'Astrophysique.
**LINEARITY OF IMAGE PHOTON COUNTING SYSTEMS (IPCS)**
P. Ringoet, C. Jamar, and A. Monfils 1982 11 p refs
Avail: NTIS HC A02/MF A01

Image photon counting systems are the ultimate way to measure bidimensional low light levels. The main drawback of these systems comes from their saturation which occurs already for weak sources. This problem is studied theoretically and analyzed for a centroiding logic. One way to improve the saturation function is described, based on the detection of the tops of the events. The curves of linearity of the system are compared with those obtained with the centroiding system. S.L.

**N83-18487#** Technical Research Centre of Finland, Espoo. Semiconductor Lab.
**ION EXCHANGED LIGHT GUIDING STRUCTURES IN GLASS Ph.D. Thesis - Helsinki Univ. of Technol., Otaniemi**
Juna Viljanen 1982 32 p refs Sponsored by Swedish Academy of Engineering Sciences in Finland
(Rept-38; ISBN-951-9090-16-9) Avail: NTIS HC A03/MF A01

A review on ion exchanged light guiding structures is given. Guide fabrication with silver sodium exchange and thin film ion sources is discussed in detail. The physics of the process is reviewed in order to theoretically describe the resulting concentration and refractive index profiles. Several experimental, multimode light channel structures are treated including also the methods used for their optical characterization. Author

**N83-18488#** Philips G.m.b.H., Aachen (West Germany).
**INVESTIGATIONS OF IMPROVEMENT OF LUMINOUS EFFICACY OF INCANDESCENT LAMPS BY MEANS OF CHEMICAL REGENERATIVE CYCLES Final Report, Dec. 1980**
Georg Dittmer, Siegfried Garbe, Anton Klopfer, Ulrich Niemann, and Erwin Schnedler Bonn Bundesministerium fuer Forschung und Technologie Oct. 1982 172 p refs In GERMAN; ENGLISH summary Sponsored by bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-82-184; ISSN-0340-7608) Avail: NTIS HC A08/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 34

The luminous efficacy of incandescent lamps may be improved by increasing the coil temperature. The objective of the project was to study whether the reduction of the lifetime caused by the higher coil temperature can be overcome by a regenerative transport cycle. Reactive systems containing halogens and oxygen, furthermore some main group elements, such as H, B, C, Si, P, As and Se, were studied. After determination of the necessary thermodynamic data for the compounds, the tungsten transport rates were calculated and compared with experimental results obtained on lamps. The results show the relation between the life time and the luminous efficacy. In the range of high coil temperatures the maximum life-time of lamps with optimum fillings is governed by the tungsten vapor pressure, i.e. a further increase is not possible by means of regenerative cycles. Author

**N83-18489#** Oak Ridge National Lab., Tenn. Fusion Energy Div.
**PRIMARY ION TETRODE OPTICS FOR HIGH TRANSPARENCY MULTIBEAMLET NEUTRAL INJECTORS**
J. H. Whealton Dec. 1981 38 p refs
(Contract W-7405-eng-26)
(DE82-005966; ORNL/TM-7870) Avail: NTIS HC A03/MF A01

A number of tetrode electrode designs are considered. An improvement resulting in 425% more brightness with 25% less source plasma is suggested from the results of solutions of the Poisson-Vlasov equations. DOE

**N83-18490#** California Univ., Livermore. Lawrence Livermore Lab.
**OPTICAL SCATTERING MEASUREMENTS FROM 1.06 MICRONS AND 0.35 MICRONS LASER HEATED TARGETS**
R. E. Turner, E. M. Campbell, B. F. Lasinski, W. L. Mead, D. W. Phillion, and F. Ze Oct. 1981 24 p refs Presented at the Am. Phys. Soc. 23rd Ann. Meeting, New York, 12-16 Oct. 1981
(Contract W-7405-eng-48)
(DE82-004385; UCRL-86420-Rev-1; CONF-811028-9-Rev-1) Avail: NTIS HC A02/MF A01

Scattered light measurements were obtained on Argus disk target experiments at 1.06 micrometer, 0.53 micrometer, and 0.35 micrometer laser wavelengths. Backscatter measurements taken near the three laser wavelengths for SBS, and measurements of the three-halves and second harmonics taken during the two longer wavelength laser irradiations are presented. The SBS measurements show the strong influence of the increased absorption at the shorter laser wavelengths. The spectra of the three-halves harmonic emissions are analyzed to provide a time averaged electron temperature at quarter critical density. Time resolved Raman scattering data are presented for gold and Be disks irradiated with up to 180 J of green light. DOE

**N83-18491#** Pacific Northwest Lab., Richland, Wash. Materials Dept.
**OPTICAL PROPERTIES OF SPUTTERED Si:H**
P. M. Martin, W. T. Pawlewicz, and I. B. Mann Dec. 1981 18 p refs Presented at the SPIE Optical Coatings for Energy Efficiency and Solar Appl. Conf., Los Angeles, 25 Jan. 1982
(Contract DE-AC06-76RL-01830)
(DE82-007072; PNL-SA-9858A; CONF-820107-5) Avail: NTIS HC A02/MF A01

Sputtered Si:H is a very promising material for use in thin film solar cells, solar selective absorbers and optical coatings for the

near infrared. Optical property - composition relationships have been determined for Si:H coatings having wide ranges of H content and Si:H bonding. The dependence of the optical absorption edge, optical band gas and refractive index at 2 micrometers wavelength on H content and Si:H bonding is described. Microstructural and topographical features of the films which influence their absorption and scattering characteristics a e discussed. Composition and bonding diagrams used to select deposition conditions for the desired optical properties are also presented. Finally, multilayer Si:H/SiO2 all-dielectric laser mirrors with reflectances greater than 99% at 1.315, 2.7 and 3.8 micrometers are described to illustrate the application of these coatings. DOE

**N83-18492#** Florida State Univ., Tallahassee.
**DAMAGING EFFECTS OF VISIBLE LIGHT Progress Report, 1 Jun. 1982 - 31 May 1983**
Theodore P. Williams and Barbara N. Baker Feb. 1982 17 p refs
(Contract DE-AS05-78OR-06021)
(DE82-011597; DOE/OR-06021/4) Avail: NTIS HC A02/MF A01

The right eyes of anesthetized, ten week old albino rats are exposed to constant photon fluxes at 6 wavelengths for 6 hours. The left eye of each animal is patched during the exposure and is used as control. Histologic examination of retinal sections disclosed a region in the superior retina which is more damaged than are other areas. Attempting to ascertain an action spectrum by measuring outer nuclear layer (ONL) lost in this sensative region fails. However, it is shown that when ONL thickness is integrated over the entire retinal sections, a rhodopsin action-spectrum emerges. It is concluded that retinal light damage in the albina rat under these conitions is rhodopsin mediated; and assessment of the extent of damage is best made by some method which integrates over the entire retinal section. The latter methodology is not routinely incorporated into studies of retinal light-damage but probably should be. DOE

**N83-18493#** Oak Ridge National Lab., Tenn.
**MAGNETO-OPTIC AND ELECTRO-OPTIC MODULATORS**
D. P. Hutchinson, C. H. Ma, T. R. Price, P. A. Staats, and K. L. VanderSluis 1982 9 p refs Presented at the US/Japan Workshop on Sub-Millimeter Diagnostic Tech., Nagoya, Japan, 18 Jan. 1982
(Contract W-7405-eng-26)
(DE82-011450; CONF-820125-2) Avail: NTIS HC A02/MF A01

An important aspect of the Faraday rotation diagnostic for Tokamak plasma measurements was the development of suitable polarization modulators for submillimeter wavelengths. The problems are to obtain high optical transmission and fast modulation frequencies. Magneto-optic and electro-optic submillimeter-wave modulators were developed. These devices operated at modulation frequencies of approximately 100 kHz and both have high transmission. DOE

**N83-18494#** Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Space Div.
**THERMAL TEST EVALUATION OF THE GERMAN INFRARED LABORATORY**
Jochen Doenecke and Martin Sander Jun. 1982 8 p refs Sponsored by Bundesministerium fuer Forschung und Technologie
(MBB-UR-566-82-O-E) Avail: Issuing Activity

The test model of the German Infrared Laboratory designed for space shuttle missions and the evaluation of the thermal balance tests are described. This model was shortened compared to the flight unit and sealed for evacuation. Discrepancies around 50 % between measured and calculated He-flow rates were encountered. A 144 mode model was established, yielding agreement between measured and calculated He-flow rates for telescope cooling. For further improvement of the analytical tool, model data were adjusted according to temperatures measured during five different equilibrium conditions. The deviations between measured and calculated temperatures are reduced from 36K to < 4K. Several measures are suggested to reduce the comsumption. Calculations show that these measures increase the operational lifetime by a factor of about two. Author (ESA)

# 75 PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion.
For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

**N83-18495#** Nagoya Univ. (Japan). Inst. of Plasma Physics.
**REPETITIVE DISPLAY SYSTEM OF LINE PROFILES FOR DOPPLER BROADENING MEASUREMENT**
A. Mohri, K. Narihara, and K. Haba Oct. 1982 14 p
(IPPJ-T-34) Avail: NTIS HC A02/MF A01

Line profiles of impurities in visible and ultraviolet regions are repetitively displayed on a CRT with an interval of 250 microseconds or 500 microseconds, using a system composed of a Czerny-Turner monochromator with 1 m F.L., a self-resonant optical scanner, a photomultiplier shielded against hard X-rays and electronic circuits. The profile resolution is 0.035 nm FWJM. This system can be used in the environment of strong hard X-rays. Author

**N83-18496#** Nagoya Univ. (Japan). Inst. of Plasma Physics.
**A MONTE-CARLO SIMULATION FOR NEUTRAL BEAM PROBING OF PLASMA CURRENT PROFILE**
Sadao Masamune (Kyoto Technical Univ., Japan), Hiroyuki Okada (Kyoto Univ., Japan), Mitsuru Yamagiwa (Kyoto Univ., Japan), Masao Okamoto, and Hiroshi Nishihara (Kyoto Univ., Japan) Oct. 1982 17 p refs
(IPPJ-614) Avail: NTIS HC A02/MF A01

The profile of birth points of the secondary ions in the NOVA II plasma was calculated when probed by a neutral beam. The orbits of secondary ions were calculated and the resultant traces, curves formed by tracks of the ions impinging the detector plate, were obtained for the purpose of the neutral beam probing of plasma current profile. A slight reduction of the sensitivity of the trace to the plasma current profile due to the toroidal field ripple, as well as the spread of the trace due to the finite divergence of the probing beam, brings about no substantial difficulty in identifying the plasma current profile. M.G.

**N83-18497#** Nagoya Univ. (Japan). Inst. of Plasma Physics.
**SHEATH POTENTIAL GENERATED BY A RELATIVISTIC ELECTRON BEAM**
Kazunari Ikuta and Isao Ueno (Tokyo Univ., Japan) Oct. 1982 16 p refs
(IPPJ-615) Avail: NTIS HC A02/MF A01

It is pointed out that a new sheath structure is formed in a plasma where the relativistic electron beam is injected. An application of this sheath to the pinched plasma ion beam source is described in order to avoid the electron bombardment on the electrode. Author

**N83-18498#** Fom-Instituut voor Plasmafysica, Jutphaas (Netherlands).
**IDEAL MHD EQUILIBRIUM OF A WEAKLY TOROIDAL PLASMA COLUMN WITH ELONGATED CROSS-SECTION. PART 3: NONELLIPTICAL CROSS-SECTION AND SUMMARY**
A. J. vandenBogert, E. J. M. vanHeesch, and W. Schuurman Sep. 1982 31 p refs Sponsored by Euratom and Nederlandse Organisatie voor Zuiver-Wetenschappelijk Onderzoek (ZWO)
(Rept-82-144) Avail: NTIS HC A03/MF A01

Ideal MHD equilibrium of a straight plasma column with elliptic cross section surrounded by a vacuum region (Gajewski's model) is extended to include the case of weakly nonelliptic cross sections. Two methods of treating the perturbation of the plasma boundary analytically are described. They are illustrated by numerical examples and the limits of their applicability are indicated. Finally, some equilibria are constructed of a weakly toroidal plasma, surrounded by a force free field region with the elliptical cross section deformed in the direction of a racetrack. S.L.

**N83-18499#** Oak Ridge National Lab., Tenn. Metals and Ceramics Div.
**HYDROGEN-DEUTERIUM CHANGEOVER EXPERIMENTS IN A PLASMA-WALL INTERACTION SIMULATOR**
R. E. Clausing, L. Heatherly, and L. C. Emerson 1981 16 p refs Presented at the Am. Vacuum Soc. Natl. Symp., Anaheim, Calif., 3 Nov. 1981
(Contract W-7405-eng-26)
(DE82-004051; CONF-811113-44) Avail: NTIS HC A02/MF A01

Hydrogen recycling from walls and limiters of Tokamaks constitutes the major source of plasma particles after the initial few milliseconds of a plasma pulse. The physical processes involved in recycling are thus very important to the control of plasma density and composition. Isotope changeover experiments in the laboratory show that thermally activated processes such as recombination and diffusion play significant roles in recycling. These processes are important not only during the plasma pulse but also continue after the plasma pulse ends, thus the length of time between pulses, the wall temperature and the vacuum pumping rate all influence changeover dynamics. This paper shows that for type 304 stainless steel walls changeover can range from > 95% to < 50% complete in one 200 ms pulse depending upon these parameters. The initial part of changeover during a plasma pulse is very rapid and involves equilibrating the isotopic compositions of the plasma reservoir and near-surface wall hydrogen reservoir involved in recycling. DOE

**N83-18500#** Oak Ridge National Lab., Tenn.
**FUELING OF MAGNETIC-CONFINEMENT DEVICES**
S. L. Milora 1981 35 p refs Presented at the Am. Vacuum Soc. Natl. Symp., Anaheim, Calif., 3 Nov. 1981
(Contract W-7405-eng-26)
(DE82-004055; CONF-811113-46) Avail: NTIS HC A03/MF A01

A general overview of the fueling of magnetic confinement devices is presented, with particular emphasis on recent experimental results. Various practical fueling mechanisms are considered, such as cold gas inlet (or plasma edge fueling), neutral beam injection, and injection of high speed cryogenic hydrogen pellets. The central role played by charged particle transport and recycle of plasma particles from material surfaces in contact with the plasma is discussed briefly. The various aspects of hydrogen pellet injection are treated in detail, including applications to the production of high purity startup plasmas for stellarators and other devices, refueling of Tokamak plasmas, pellet ablation theory, and the technology and performance characteristics of low and high speed pellet injectors. DOE

**N83-18501#** California Univ., Livermore. Lawrence Livermore Lab.
**PROJECTIONS OF TRANSPORT SCALING LAWS FOR SMALL TOROIDAL REACTORS**
Brendan McNamara 16 Nov. 1981 5 p refs Presented at the 9th Symp. on Eng. Probl. of Fusion Res., Chicago, 26-29 Oct. 1981
(Contract W-7405-eng-48)
(DE82-006779; UCRL-86914) Avail: NTIS HC A02/MF A01

Small Spheromak reactors are feasible using pessimistic ion confinement scaling and neutral beam current drive to support the configuration in steady state. The effective Q can be enhanced considerably by switching beams off when not needed for current drive. These general concepts were used as the basis of a study of Spheromak reactor engineering. S.L.

**N83-18502#** General Atomic Co., San Diego, Calif.
**COMPUTER ANALYSIS SIMULATION OF DEE-SHAPED PLASMA EQUILIBRIUM IN DOUBLET 3 DURING NBI HEATING**
K. Shinya and H. Yokomizo Dec. 1981 29 p refs
(Contract DE-AT03-80SF-11512; GA Proj. 3313)
(DE82-005725; GA-A-16505) Avail: NTIS HC A03/MF A01

An estimation of the equilibrium magnetic field configuration in Doublet III during NBI heating was carried out for prescribed plasma positions and shapes without solving the Grad-Shafranav equation. The psi values at the flux loops obtained by a simple estimation code ESTHER were used as a boundary condition for the equilibrium calculation of these plasmas using the MHDAPT code. Plasmas having almost the same positions and shapes as the prescribed ones are obtainable, thus showing that this simple estimation method is a powerful tool for evaluating the plasma equilibrium during the NBI heating. A multipole field expansion analysis of the equilibrium magnetic field showed that the quadrupole and hexapole fields as well as the dipole field should be adjusted during the heating if a constant plasma shape is desirable. DOE

**N83-18503#** California Univ., Livermore. Lawrence Livermore Lab.
**PRODUCTION AND LOSS OF H(-) AND D(-) IN THE VOLUME OF A PLASMA**
G. W. Hamilton and M. Bacal (Ecole Polytechnique) 22 Oct. 1982 9 p refs Presented at the 15th Intern. Conf. on Phenomena in Ionized Gases, Minsk, 14 Jul. 1981
(Contract W-7405-eng-48)
(DE82-004391; UCRL-85970-Rev-1; CONF-810729-Rev-1) Avail: NTIS HC A02/MF A01

The study of the production and loss of negative ions, H(-) and D(-), in the volume of a plasma has received considerable attention since the measurement of anomalously high densities of H- in 1977. The most probable mechanism for production is dissociative attachment (DA) to vibrationally highly-excited hydrogen molecules. New diagnostics developed for this purpose are photodetachment and the extension of coherent anti-Stokes Raman scattering (CARS) systems to the sensitivity required for low-pressure gases. Measurements and calculations indicate that the important loss mechanisms are diffusion to the walls at low densities and collisional destruction of several types at plasma densities above 10 to the 10th power/cu cm. Production mechanisms must be highly efficient to compete with the losses. It appears to be straightforward to extrapolate measurements and theory to the densities about 10 to the 12th power/cu cm that are required for an intense source of D(-) fo neutral beam injection into magnetically-confined fusion devices. DOE

**N83-18504#** California Univ., Livermore. Lawrence Livermore Lab.
**OPTICAL MEASUREMENTS OF THE OMEGA O/2 AND 3/2 OMEGA O LIGHT FROM 1.064 MICRONS IRRADIATED PLASMAS**
D. W. Phillion and R. E. Turner 1981 24 p Presented at the Am. Phys. Soc. 23rd Ann. Meeting, New York, 12-16 Oct. 1981
(Contract W-7405-eng-48)
(DE82-006316; UCRL-86416-Rev-1; CONF-811028-10-Rev-1) Avail: NTIS HC A02/MF A01

The spectrum and absolute level of both the omega sub 0/2 and 3/2 omega sub 0 light were measured at Argus over a wide range of intensities, spot sizes, and energies (3 to 500 joules at 700ps). The spectrum, time dependence, and angular distribution of the Raman-scattered light measured at Shiva are also presented. A particularly interesting experiment was performed at Argus in which a 500A thick Formvar (CH) foil was irradiated with 90 joules in 700ps. The spot size was 200 micrometer with a diverging f/2 beam. A calorimeter measured 0.1 J/sr in Raman light in the backwards direction. Discrete InAs detectors looking at the amount of Raman light at 1.9 and 2.0 micrometer detected about as much in the forward direction as the backward direction. DOE

**N83-18505#** California Univ., Livermore. Lawrence Livermore Lab.
**THE NEGATIVE TANDEM MIRROR**
P. Poulsen, S. L. Allen, T. A. Casper, D. P. Grubb, R. A. Jong, W. E. Nexsen, G. D. Porter, and T. C. Simonen 30 Nov. 1981 13 p refs Presented at the 2nd Workshop on Hot Electron Ring Phys., San Diego, Calif., 1-3 Dec. 1981
(Contract W-7405-eng-48)
(DE82-004762; UCRL-86845; CONF-811203-5) Avail: NTIS HC A02/MF A01

A tandem mirror configuration can be created by combining

hot electron end cell plasmas with neutral beam pumping. A region of large negative potential formed in each end cell confines electrons in the central cell. The requirement of charge neutrality causes the central cell potential to become negative with respect to ground in order to confine ions as well as electrons. The method of producing and calculating the desired axial potential profile is discussed and the calculated axial potential profile and plasma parameters for a negative configuration of TMX-Upgrade are shown. DOE

**N83-18506#** California Univ., Berkeley. Lawrence Berkeley Lab. Accelerator and Fusion Research Div.

**HAMILTONIAN KINETIC THEORY OF PLASMA PONDEROMOTIVE PROCESSES**

Steven W. McDonald and Allan N. Kaufman Dec. 1981 5 p refs Presented at the Am. Inst. of Phys. Conf. on Math. Methods in Hydrodyn., La Jolla, Calif., 7-9 Dec. 1981 Submitted for publication

(Contract W-7405-eng-48)

(DE82-010597; LBL-13888; CONF-811225-2) Avail: NTIS HC A02/MF A01

The nonlinear nonresonant interaction of plasma waves and particles is formulated in a Hamiltonian kinetic theory which treats the wave-action and particle distributions on an equal footing, thereby displaying reciprocity relations. In the quasistatic limit, a nonlinear wave-kinetic equation is obtained. The generality of the formalism allows for applications to arbitrary geometry, with the nonlinear effects expressed in terms of the linear susceptibility. DOE

**N83-18507#** Princeton Univ., N. J. Plasma Physics Lab.

**RADIATED ENERGY AND IMPURITY DENSITY CHANGES DURING INTENSIVE HYDROGEN INFLUX IN THE PLT TOKAMAK**

E. Hinnov, J. Hosea, H. Hsuan, F. Jobes, E. Meservey, G. Schmidt, and S. Suckewer Dec. 1981 24 p refs

(Contract DE-AC02-76CH-03073)

(DE82-005730; PPPL-1865) Avail: NTIS HC A02/MF A01

During a discharge a puff of hydrogen is admitted, sufficient to more than triple the plasma density, and the resulting changes in various plasma parameters are determined. The absolute densities of various wall and limiter (carbon) materials are found to decrease by a substantial fraction, probably as a result of lowered peripheral temperature. The radiation pattern deduced from spectroscopically determined plasma composition is in good quantitative agreement with direct bolometric measurements. In the interior of the discharge radiation constitutes only a small part of the power input. Neither the radiated power nor the power input changes very markedly as a result of the density rise, since the effects of temperature and plasma composition changes tend to compensate each other. DOE

**N83-18508#** California Univ., Livermore. Lawrence Livermore Lab.

**DOPPLER-SHIFTED RESONANCE ABSORPTION BY HOT ELECTRONS**

J. W. Shearer 10 Nov. 1981 14 p refs Presented at the 2nd Workshop on Hot Electron Ring Phys., San Diego, Calif., 1-3 Dec. 1981 Submitted for publication

(Contract W-7405-eng-48)

(DE82-004377; UCRL-886780; CONF-811203-4) Avail: NTIS HC A02/MF A01

When the large Doppler shifts of hot-electron-ring ECRH absorption are taken into account, the spatial location of the bulk of the energy absorption can be significantly shifted from the cold-plasma resonance region. The high parallel velocity electrons absorb most of the wave energy, thereby shielding the bulk of the electron distribution from the heating source. A simple one dimensional model of this process has been formulated, based on a right-hand circularly polarized wave which is incident from the high-field side in the parallel direction. In this model, less than 1% of the electrons absorb more than 90% of the wave energy for the case of 30-keV maximum parallel electron energy, 28-GHz microwaves, and a 1-m magnetic field scale length. The effect should be included in power balance models and Fokker-Planck veocity distribution calculations. The Doppler shift also appears for a variety of ray-tracing code calculations in the MFTF-B thermal barrier region. DOE

**N83-18509#** California Univ., Livermore. Lawrence Livermore Lab.

**HIGH-FREQUENCY MICROINSTABILITIES IN HOT-ELECTRON PLASMAS**

Yu-Jiuan Chen, William M. Nevins, and Gary R. Smith 24 Nov. 1981 11 p refs Presented at the 2nd Workshop on Hot Electron Ring Phys., San Diego, Calif. 1-3 Dec. 1981 Submitted for publication

(Contract W-7405-eng-48)

(DE82-004387; UCRL-86825; CONF-811203-1) Avail: NTIS HC A02/MF A01

Instabilities with frequencies in the neighborhood of the electron cyclotron frequency are of interest in determining stable operating regimes of hot-electron plasmas in EBT devices and in tandem mirrors. Previous work used model distributions significantly different than those suggested by recent Fokker-Planck studies. We use much more realistic model distributions in a computer code that solves the full electromagnetic dispersion relation governing longitudinal and transverse waves in a uniform plasma. We allow for an arbitrary direction of wave propagation. Results for the whistler and upper-hybrid loss-cone instabilities are presented. DOE

**N83-18510#** Pacific Northwest Lab., Richland, Wash. Materials Dept.

**FLOW AND FRACTURE IN THE FUSION ENVIRONMENT**

R. H. Jones 1981 13 p refs Presented at the Fusion Reactor Mater. Meeting, Seattle, 9 Aug. 1981

(Contract DE-AC06-76RL-01830)

(DE82-006882; PNL-SA-9759; CONF-810831-81) Avail: NTIS HC A02/MF A01

Studies were performed on fusion reactor materials. Emphasis was given to the following: austenitic stainless steels; ferritic stainless steels; and modelling for chemical environment effects on fracture. L.F.M.

**N83-18511#** Mound Lab., Miamisburg, Ohio.

**TRITIUM TRANSPORT AND CONTROL IN THE FED**

Michael L. Rogers 1981 4 p Presented at the 9th Symp. on Eng. Probl. of Fusion Res., Chicago, 26 Oct. 1981

(Contract DE-AC04-76DP-00053)

(DE82-002592; MLM-2871(OP); CONF-811040-60) Avail: NTIS HC A02/MF A01

The tritium systems for the FED have three primary purposes. The first is to provide tritium and deuterium fuel for the reactor. This fuel can be new tritium or deuterium delivered to the plant site, or recycled DT from the reactor that must be processed before it can be recycled. The second purpose of the FED tritium systems is to provide state-of-the-art tritium handling to limit worker radiation exposure and to minimize tritium losses to the environment. The final major objective of the FED tritium systems is to provide an integrated system test of the tritium handling technology necessary to support the fusion reactor program. Every effort is being made to incorporate available information from the Tritium System Test Assembly (TSTA) at Los Alamos National Laboratory, the Tokamak Fusion Test Reactor (TFTR) tritium systems, and the tritium handling information generated within DOE for the past 20 years. DOE

**N83-18512#** Los Alamos Scientific Lab., N. Mex.

**UTILIZATION OF THE CATALYZED-DD FUEL CYCLE IN REVERSED-FIELD PINCH REACTORS (RFPRS)**

R. L. Hagenson and R. A. Krakowsi 1981 7 p refs Presented at the Alternate Fuels Reactor Workshop, La Jolla, Calif., 7-8 Dec. 1981

(Contract W-7405-eng-36)

(DE82-010425; LA-UR-82-207; CONF-811228-1) Avail: NTIS

HC A02/MF A01

The utilization of deuterium-based fuels offers the potential advantages of greater flexibility in blanket design, significantly reduced tritium inventory, potential reduction in radioactivity level, and utilization of an inexhaustible fuel supply. The extension of the conventional DT-fueled Reversed-Field Pinch Reactor (RFPR) designs to advanced-fuel (catalyzed-DD) operation has recently been reported. Attractive and economically competitive DD/RFPR systems are identified having power densities and plasma parameters comparable to the DT systems. These designs are compared to other fusion reactor designs. DOE

**N83-18513#** California Univ., Livermore. Lawrence Livermore Lab.

**COMPARATIVE END-PLUG STUDY FOR TANDEM-MIRROR REACTORS**

G. A. Carlson, W. L. Barr, B. M. Boghosian, R. S. Devoto, J. N. Doggett, G. W. Hamilton, B. M. Johnston, W. N. Kumai, J. D. Lee, B. G. Logan et al 15 Dec. 1981 190 p refs

(Contract W-7405-eng-48)

(DE82-004008; UCID-19271) Avail: NTIS HC A09/MF A01

A comparative evaluation was made of several end plug configurations for tandem mirror fusion reactors with thermal barriers. The axicell configuration has been selected for further study and will be the basis for a detailed conceptual design study to be carried out over the next two years. The axicell end plug has a simple mirror cell produced by two circular coils followed by a transition coil and a yin-yang pair, which provides for MHD stability. DOE

**N83-18514#** Los Alamos Scientific Lab., N. Mex.

**GYROSCOPIC ANALOG FOR MAGNETOHYDRODYNAMICS**

Darryl D. Holm 1981 15 p refs Presented at the Conf. on Dyn. Systems in Hydrodyn., La Jolla, Calif., 7-9 Dec. 1981

(Contract W-7405-eng-36)

(DE82-006107; LA-UR-81-3574; CONF-811225-1) Avail: NTIS HC A02/MF A01

It is demonstrated that the gross features of plasma equilibrium and dynamics in the ideal magnetohydrodynamics (MHD) model can be understood in terms of a dynamical system which closely resembles the equations for a deformable gyroscope. DOE

**N83-18515#** Princeton Univ., N. J. Plasma Physics Lab.

**FEEDBACK STABILIZATION OF AXISYMMETRIC MODES IN TOKAMAKS**

S. C. Jardin and D. A. Larrabee Jan. 1982 14 p refs

(Contract DE-AC02-76CH-03073)

(DE82-010703; PPPL-1863) Avail: NTIS HC A02/MF A01

Noncircular Tokamak plasmas can be unstable to ideal MHD axisymmetric instabilities. Passive conductors with finite resistivity will at best slow down these instabilities to the resistive (L/R) time of the conductors. An active feedback system far from the plasma which responds on this resistive time can stabilize the system provided its mutual inductance with the passive coils is small enough. DOE

**N83-18516#** Princeton Univ., N. J. Plasma Physics Lab.

**LEAKAGE OF RUNAWAY ELECTRONS FROM TOKAMAKS**

K. L. Wong Feb. 1982 12 p refs

(Contract DE-AC02-76CH-03073)

(DE82-008317; PPPL-1875) Avail: NTIS HC A02/MF A01

Runaway electron orbits are calculated in a Tokamak magnetic field. It is shown that these electrons tend to drift towards a larger major radius with a velocity v Vector/sub R/ = qcE/B0R. This effect may be relevant to some recent experimental observations in Tokamaks. DOE

**N83-18517#** Princeton Univ., N. J. Plasma Physics Lab.

**OBSERVED TRANSITIONS IN n = 2 GROUND CONFIGURATION OF COPPER, NICKEL, IRON, CHROMIUM AND GERMANIUM IN TOKAMAK DISCHARGES**

E. Hinnov, S. Suckewer, and K. Sato (Nagoya Univ.) Nov. 1981 26 p refs

(Contract DE-AC02-76CH-03073)

(DE82-008319; PPPL-1848) Avail: NTIS HC A03/MF A01

A number of spectrum lines of highly ionized copper, nickel, iron, chromium, and germanium have been observed and the corresponding transitions identified. The element under study is introduced into the discharge of the PLT Tokamak by means of rapid ablation by a laser pulse. The ionization state is generally distinguishable from the time behavior of the emitted light. New identifications of transitions are based on predicted wavelengths (from isoelectronic extrapolation and other data) and on approximate expected intensities. All the transitions pertain to the ground configurations of the respective ions, which are the only states strongly populated at Tokamak plasma conditions. These lines are expected to be useful for spectroscopic plasma diagnostics in the 1-3 keV temperature range, and they provide direct measurement of intersystem energy separations from chromium through copper in the oxygen, nitrogen, and carbon isoelectronic sequences. DOE

**N83-18518#** Princeton Univ., N. J. Plasma Physics Lab.

**IDEAL MAGNETOHYDRODYNAMIC STABILITY OF THE SPHEROMAK CONFIGURATION**

S. C. Jardin 19 Jan. 1982 44 p refs

(Contract DE-AC02-76CH-03073)

(DE82-011310; PPPL-1861) Avail: NTIS HC A03/MF A01

Results are presented of a parametric study of the ideal magnetohydrodynamic stability properties of the Spheromak, or compact torus, configuration. In the absence of a nearby conducting wall, the Spheromak is always unstable to at least one current driven mode. With a conducting wall at the surface, the Spheromak can be unstable to current driven modes if the current is too peaked, i.e., q(sub o)(R/a) < 2/3, or if the shear is too low at the origin. The Mercier criterion sets an upper limit on the pressure gradient everywhere, but configurations that are everywhere Mercier stable can be unstable to pressure driven low-n modes. Stable toroidal configurations exist with a spherical wall separated by half a minor radius, and with beta (sub theta) = 30%. DOE

**N83-18519#** Princeton Univ., N. J. Plasma Physics Lab.

**RESULTS FROM LANGMUIR PROBE MEASUREMENTS IN PDX AND PLT**

Robert Budny Feb. 1982 16 p refs

(Contract DE-AC02-76CH-03073)

(DE82-008315; PPPL-1876) Avail: NTIS HC A02/MF A01

Fits to Langmuir probe measurements made near the midplanes of the PDX and PLT Tokamaks imply density and electron temperature profiles. In ohmically heated plasmas with either circular or diverted configurations, the edge densities decrease approximately exponentially with e-folding lengths of 1-4cm. Electron temperatures are low (5 to 50 eV) and decrease more gradually than the density profiles in the outer edge. DOE

**N83-18520#** California Univ., Berkeley. Lawrence Berkeley Lab. Accelerator and Fusion Research Div.

**THE HAMILTONIAN STRUCTURE OF MULTI-SPECIES FLUID ELECTRODYNAMICS**

Richard G. Spencer Dec. 1981 7 p refs Presented at the AIP Conf. on Math. Methods in Hydrodyn., La Jolla, Calif., 7-9 Dec. 1981 Submitted for publication

(Contract W-7405-eng-48)

(DE82-011778; LBL-13959; CONF-811225-3) Avail: NTIS HC A02/MF A01

The phase space for multi-species fluid electrodynamics is the function space of fluid variables and Maxwell field variables. The Poisson bracket on phase functionals is constructed as a Lie algebra product following general methods of infinite dimensional symplectic geometry. DOE

**N83-18521#** California Univ., Livermore. Lawrence Livermore Lab. Accelerator and Fusion Research Div.

**NONCANONICAL HAMILTONIAN METHODS IN PLASMA DYNAMICS**

Allan N. Kaufman Nov. 1981 6 p refs Presented at the Japan/US

Workshop on Nonequilibrium Statistical Phys., Kyoto, 9-13 Nov. 1981
(Contract W-7405-eng-48)
(DE82-008429; LBL-13621; CONF-811185-1) Avail: NTIS HC A02/MF A01

A Hamiltonian approach to plasma dynamics has numerous advantages over equivalent formulations which ignore the underlying Hamiltonian structure. In addition to achieving a deeper understanding of processes. Hamiltonian methods yield concise expressions (such as the Kubo form for linear susceptibility), greatly shorten the length of calculations, expose relationships (such as between the ponderomotive Hamiltonian and the linear susceptibility), determine invariants in terms of symmetry operations, and cover situations of great generality. In addition, they yield the Poincare invariants, in particular Liouville volume and adiabatic actions. DOE

**N83-18522#** Princeton Univ., N. J. Plasma Physics Lab.
**PARTICLE DIFFUSION IN TOKAMAKS WITH PARTIALLY DESTROYED MAGNETIC SURFACES**
A. H. Boozer and R. B. White Feb. 1982 18 p refs
(Contract DE-AC02-76CH-03073)
(DE82-009820; PPPL-1872) Avail: NTIS HC A02/MF A01

A Hamiltonian formalism is developed for the drift orbit trajectories of particles in toroidal systems in the presence of stochastic fields. The equations of motion are integrated numerically to investigate the modification of neoclassical diffusion in a Tokamak due to the onset of stochasticity. Quasilinear diffusion is observed for fields with well developed stochasticity. A significant increase in the diffusion coefficient is observed below the stochastic threshold for electrons, whereas ions are typically not affected until the magnetic field has become quite stochastic. DOE

**N83-18523#** California Univ., Livermore. Lawrence Livermore Lab.
**TRANSFORT AND EQUILIBRIUM IN FIELD-REVERSED MIRRORS**
John K. Boyd Sep. 1982 392 p refs
(Contract W-7405-eng-48)
(DE83-001915; UCRL-53327) Avail: NTIS HC A17/MF A01

Two plasma models relevant to compact torus research were developed to study transport and equilibrium in field reversed mirrors. In the first model for small Larmor radius and large collision frequency, the plasma is described as an adiabatic hydromagnetic fluid. In the second model for large Larmor radius and small collision frequency, a kinetic theory description was developed. Various aspects of the two models were studied in five computer codes; ADB, AV, NEO, OHK, RES. The ADB code computes two dimensional equilibrium and one dimensional transport in a flux coordinate. The AV code calculates orbit average integrals in a harmonic oscillator potential. The NEO code follows particle trajectories in a Hill's vortex magnetic field to study stochasticity, invariants of the motion, and orbit average formulas. The OHK code displays analytic psi(r), B sub Z(r), phi(r), E sub r(r) formulas developed for the kinetic theory description. The RES code calculates resonance curves to consider overlap regions relevant to stochastic orbit behavior. DOE

**N83-18524#** McDonnell-Douglas Astronautics Co., St. Louis, Mo.
**ELMO BUMPY TORUS PROOF OF PRINCIPLE. PHASE 2, TITLE 1 REPORT. VOLUME 2: DEVICE SUMMARY**
David W. Haas Feb. 1982 60 p refs
(Contract W-7405-eng-26)
(DE83-001326; ORNL/SUB-81-21099/1-01-Vol-1; EBT-P010-Vol-2) Avail: NTIS HC A04/MF A01

An EBT type device is designed to advance the EBT magnetic confinement fusion concept to the proof of principle level. Plasma parameters are extended into the reactor range and the validity of scaling laws are determined for the parameter regime characteristic of EBT-P plasmas. Core plasmas of intermediate values of beta (plasma pressure/magnetic pressure) are studied to determine if they can be confined in a stable fashion. DOE

**N83-18525#** McDonnell-Douglas Astronautics Co., St. Louis, Mo.
**ELMO BUMPY TORUS PROOF OF PRINCIPLE. PHASE 2, TITLE 1 REPORT. VOLUME 9: SUPPORT STRUCTURE**
Jack L. Conlee 26 Feb. 1982 128 p
(Contract W-7405-eng-26)
(DE83-001502; ORNL/Sub-81-21099/1-09-Vol-9; EBT-P010-Vol-9) Avail: NTIS HC A07/MF A01

The EBT-P support structure, which provides structural support for the 36 mirror coil magnets, magnet protection system, the toroidal vessel, and much of the device ancillary equipment, is described. The structure is comprised of a primary support and a superstructure. The primary support is a reinforced concrete ring located directly inboard of the torus and is supported by nine columns. The toroidal vessel and the mirror coil magnets are cantilevered from the ring with the centerline of the torus located eight feet above the floor. The superstructure is an aluminum truss structure that rests on the concrete ring. The superstructure provides support for the device ancillary equipment. Engineering drawings of the support structure are given. DOE

**N83-18526#** McDonnell-Douglas Astronautics Co., St. Louis, Mo.
**ELMO BUMPY TORUS PROOF OF PRINCIPLE, PHASE 2: TITLE 1 REPORT. VOLUME 4: MICROWAVE SYSTEM**
R. N. Adams 26 Feb. 1982 210 p refs
(Contract W-7405-eng-26)
(DE83-001503; ORNL/Sub-81-21099/1-04) Avail: NTIS HC A10/MF A01

The EBT-P Microwave System provides microwaves for electron cyclotron resonance heating (ECRH) to both stabilize and heat the EBT-P plasma. A 28 gigahertz (GHz) system is required to form the hot electron annulus plasma that provides MHD stabilization to the core plasma. A 60 GHz system is required to heat the core plasma and will provide some second harmonic heating of the hot electron annulus. The principal microwave system elements and their design characteristics are summarized. The microwave system includes 200 kilowatt (kW) gyrotrons at 60 GHz for core heating and 200 kW gyrotrons at 28 GHz tubes and two (2) 28 GHz tubes. PACE (Plant and Capital Equipment) procurement will include four (4) 60 GHz gyrotrons with two (2) GHz tubes procured under operations and the two (2) 28 GHz tubes will be provided, with mounts, from the EBT-S program. Each tube is rigidly mounted on an oil filled tank assembly which provides electrical isolation and cooling. All tubes and mounts will be located in the lower level of the torus enclosure. An extensive demineralized water flow system is required to provide gyrotron cooling. DOE

**N83-18527#** Massachusetts Inst. of Tech., Cambridge. Nuclear Reactor Lab.
**APPLICATION OF HIGH-STRENGTH COPPER ALLOYS FOR A FUSION-REACTOR FIRST WALL**
O. K. Harling, G. P. Yu, N. J. Grant, and J. E. Meyer 1981 6 p refs Presented at the Fusion Reactor Mater. Meeting, Seattle, 9 Aug. 1981
(Contract DE-AS02-78ER-10107)
(DE82-006754; DOE/ER-10107/9; CONF-810831-72) Avail: NTIS HC A02/MF A01

High strength copper alloys can be produced by advanced powder metallurgical processes. These materials are considered for application as primary structural alloys in fusion reactors. Comparisons are made, for relevant properties, with other candidate structural alloys such as austenitic stainless steel and refractory alloys. Advanced copper alloys are sufficiently attractive to warrant further consideration for the fusion reactor application. DOE

# 76 SOLID-STATE PHYSICS

Includes superconductivity.

For related information, see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers.*

**N83-18528*#** California Inst. of Tech., Pasadena. Geology and Planetary Science.

**RETENTION OF ION-IMPLANTED-XENON IN OLIVINE: DEPENDENCE ON IMPLANTATION DOSE**

C. L. Melcher, T. A. Tombrello, and D. S. Burnett [1982] 21 p refs

(Grants NAGw-148; NSF PHY-79-23638)

(NASA-CR-169892; NAS 1.26:169892) Avail: NTIS HC A02/MF A01 CSCL 20L

The diffusion of Xe in olivine, a major mineral in both meteorites and lunar samples, was studied. Xe ions were implanted at 200 keV into single-crystal synthetic-forsterite targets and the depth profiles were measured by alpha particle backscattering before and after annealing for 1 hour at temperatures up to 1500 C. The fraction of implanted Xe retained following annealing was strongly dependent on the implantation dose. Maximum retention of 100% occurred for an implantion dose of 3 x 10 to the 15th power Xe ions/sq cm. Retention was less at lower doses, with (approximately more than or = 50% loss at one hundred trillion Xe ions/sq cm. Taking the diffusion coefficient at this dose as a lower limit, the minimum activation energy necessary for Xe retention in a 10 micrometer layer for ten million years was calculated as a function of metamorphic temperature. Author

**N83-18529*#** Maryland Univ., College Park. Dept. of Physics and Astronomy.

**PROPERTIES OF LARGE NEARLY PERFECT CRYSTALS AT VERY LOW TEMPERATURES Final Report**

W. Davis, K. R. Krack, J.-P. Richard, and J. Weber Jan. 1983 18 p

(Contract NAG1-151)

(NASA-CR-169894; NAS 1.26:169894) Avail: NTIS HC A02/MF A01 CSCL 20L

A liquid helium cryostat of a size and construction unavailable commercially, was built for use in measuring the Q of several materials at milli-Kelvin temperatures. The design and testing of the cryostat is described as well as the design of the experiment vacuum chamber and adaptor for the dilution refrigerator insert. Theory, design, and testing are also discussed for the magnetic coils built to levitate the materials so as to isolate them and increase the measured Q. A four point suspension with capacitor end plates as the transducer was used to obtain preliminary Q measurements of 6061 aluminum alloy and single crystal silicon. Results are tabulated. A.R.H.

**N83-18530#** California Univ., Livermore. Lawrence Livermore Lab. Earth Sciences Div.

**THERMAL CONDUCTIVITY AND DIFFUSIVITY OF CLIMAX STOCK QUARTZ MONZONITE AT HIGH PRESSURE AND TEMPERATURE**

W. B. Durham and A. E. Abey Nov. 1981 11 p refs Presented at the 17th ITCC Conf., Gaithersburg, Md. 15 Jun. 1981

(Contract W-7405-eng-48)

(DE82-005826; UCRL-86619-Rev-1; CONF-8106198-1) Avail: NTIS HC A02/MF A01

Measurements of thermal conductivity and thermal diffusivity have been made on two samples of Climax Stock quartz monzonite at pressures between 3 and 50 MPa and temperatures between 300 and 523 K. Following those measurements the apparatus was calibrated with respect to the thermal conductivity measurement using a reference standard of fused silica. Corrected thermal conductivity of the rock indicates a value at room temperature of 2.60 + or - 0.25 W/mK at 3 MPa increasing linearly to 2.75 + or - 0.25 W/mK at 50 MPa. These values are unchanged by heating under 50 MPa confining pressure falls smoothly from 2.75 + or - 0.25 W/mK at 313 K to 2.15 + or - 0.25 W/mK at 473 K to the -6 power. Thermal diffusivity at 300 K was found to be .2 + or - 0.4 X 10 to the -6 power sq m/s and shows approximately the same pressure and temperature dependencies as the thermal conductivity. DOE

**N83-18531*#** Jet Propulsion Lab., California Inst. of Tech., Pasadena.

**PROTON NMR STUDIES OF THE ELECTRONIC STRUCTURE OF ZrH/SUB x/**

A. Attalla (Mound Lab., Miamisburg, Ohio), R. C. Bowman, Jr. (Mound Lab., Miamisburg, Ohio), B. D. Craft (Mound Lab., Miamisburg, Ohio), E. L. Venturini (Sandia Labs, Albuquerque, N. Mex.), and W. K. Rhim (California Inst. of Tech., JPL, Pasadena) 1982 6 p refs Presented at the Intern. Symp. on the Electron. Structure and Properties of Hydrogen in Metals, Richmond, Va., 4 Mar. 1982

(Contract DE-AC04-76DP-00053)

(NASA-CR-169843; NAS 1.26:169843; DE83-008461; MLM-2905(OP); CONF-820325-2) Avail: NTIS HC A02/MF A01

The proton spin lattice relaxation times and Knight shifts were measured in f.c.c. (delta-phase) and f.c.t. (epsilon-phase) ZrH/sub x/ for 1.5 < or = to x < or = to 2.0. Both parameters indicate that N(E/sub F/) is very dependent upon hydrogen content with a maximum occurring at ZrH1 83. This behavior is ascribed to modifications in N(E/sub F/) through a fcc/fct distortion in ZrH/sub x/ associated with a Jahn-Teller effect. DOE

**N83-18532*#** Jet Propulsion Lab., California Inst. of Tech., Pasadena.

**HYDROGEN DIFFUSION AND ELECTRONIC STRUCTURE IN CRYSTALLINE AND AMORPHOUS Ti/SUB y/CuH/SUB x/**

R. C. Bowman, Jr. (California Inst. of Tech., Pasadena), W. K. Rhim (California Inst. of Tech., JPL, Pasadena), A. J. Maeland (Allied Chemical Corp., Morristown, N.J.), and J. F. Lynch (Brookhaven National Lab., Upton, N. Y.) 1982 6 p refs Presented at the Intern. Symp. on the Electron. Structure and Properties of Hydrogen in Metals, Richmond, 4 Mar. 1982

(Contract DE-AC04-76DP-00053)

(NASA-CR-169844; NAS 1.26:169844; DE82-008460; MLM-2906(OP); CONF-820325-4) Avail: NTIS HC A02/MF A01 CSCL 20L

Hydrogen diffusion behavior and electronic properties of crystalline TiCuHo94, Ti2CuH1.90, and Ti2CuH2.63 and amorphous a-TiCuH1.4 were studied using proton relaxation times, proton Knight shifts, and magnetic susceptibilities. Crystal structure and hydrogen site occupancy have major roles in hydrogen mobility. The density of electron states at E sub F is reduced in amorphous a-TiCuH1.4 compared to the crystalline hydrides. DOE

**N83-18533*#** National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

**METHOD OF PREPARING RADIALLY HOMOGENEOUS MERCURY CADMIUM TELLURIDE CRYSTALS Patent Application**

Sandor L. Lehoczky (McDonnell Douglas Corp., St. Louis, Mo.) and Frank R. Szofran, inventors (to NASA) (McDonnell Douglas Corp., St. Louis, Mo.) Filed 15 Nov. 1982 15 p Sponsored by NASA

(NASA-Case-MFS-25786-1; US-Patent-Appl-SN-411896) Avail: NTIS HC A02/MF A01 CSCL 20B

A directional solidification method for preparing mercury cadmium telluride crystals is described. Hg1-xCdxTe is prepared by means of a directional solidification method in which a precast alloy sample containing predetermined amounts of H, Cd and Te is disposed in a sealed ampule and a furnace, providing two controlled temperature zones, is translated upward past the ampule so as to provide melting and resolidification. The improvement is directed to maintaining the zones at temperatures determined in accordance with a prescribed formula, providing a thermal barrier between the zones with a maximum thickness and translating the furnace past the zones at a rate less than 0.31 m/sec. Zone temperatures are selected according to the formula T sub U4 - T sub l4 = T sub l4 - T sub l4 where T sub u is the upper zone temperature, in Kelvins, T sub L is the lower zone temperature and T sub l is the solidus temperature for the particular material composition. NASA

**N83-18534#** Siemens A.G., Munich (West Germany). Forschungslab.

**DEVELOPMENT AND APPLICATION OF PROCESS AND DEVICE SIMULATION FOR 2 MICROMETER MOS TECHNOLOGY Final Report, Sep. 1981**

Armin Wieder, Leonhard Mader, Reinhard Tielert, and Christoph Werner Bonn Bundesministerium fuer Forschung und Technologie Sep. 1982 85 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-82-153; ISSN-0340-7608) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 18

The realization of VLSI chips requires extensive development of fine line technology, as well as special investigations of physical and electrical effects, which become relevant for these structures, and finally the provision and application of CAD tools in the process and device area. Within this project a basis has been realized for process and device simulation which enables effective support of our 2 microns-MOS-technology. This has to be extended to keep up with further development of integrated circuits. The redistribution of impurities during the processing can be calculated by SUPREM, which has been adapted to our technology. A new program takes care of the consideration of 2-D effects. Optical projection printing is supported by the program SAMPLE which has been adjusted to our technological apparatus and processing. An additional program was developed to consider substrate reflectivity effects. The modeling of the electrical performance of devices is enabled by a model hierarchy, ranging from effective design models to complex 2-D device simulators at DESI, PLOT-DESI and MINIMOS. Author

**N83-18535#** National Aerospace Lab., Amsterdam (Netherlands). Structures and Materials Div.

**DEVIATIONS FROM SCHMID'S LAW IN THIN COPPER SINGLE CRYSTALS**

J. J. Kolkman Jul. 1982 33 p refs Submitted for publication
(NLR-MP-81058-U) Avail: NTIS HC A03/MF A07

Plastic deformation of face centered cubic single crystals was studied by means of straining experiments inside a transmission electron microscope on Cu foils. Non-primary glide dislocations were observed. The crystallograhic orientation change of the tensile axis and the displacements of markers on the specimen surfaces indicated that the mean dislocation path lengths were very different for the different glide systems. Even when this is taken into account, non-primary systems play an important role. It is concluded that the choice of glide systems is not only governed by their resolved shear stresses (Schmid's law) but also by the crystallographic orientation of the surface. M.G.

**N83-18536#** New Jersey Inst. of Tech., Newark. Dept. of Electrical Engineering.

**MERCURY CADMIUM TELLURIDE SPUTTERING RESEARCH Final Technical Report**

Roy M. Cornely 28 Aug. 1982 93 p refs
(Grant AF-AFOSR-3249-77; AF Proj. 2306)
(AD-A121242; AFOSR-82-0936TR) Avail: NTIS HC A05/MF A01 CSCL 13/8

A large number of 10 micron thick mercury cadmium telluride films with 20 mole % CdTe were triode sputtered on silicon substrates. The sensitivity of carrier concentration and electron mobility to small changes in sputtering parameters (particularly Hg sputtering gas pressure and substrate d.c. bias and temperature) and to post deposition annealing parameters was studied. Carrier concentrations of 10 to the 15th per cubic cm at 100 degrees Kelvin were obtained in n-type films after annealing at 553 degrees Kelvin. Substrate bias, which removes impurities during sputter deposition, was found essential to obtaining n-type films. Electron mobilities were only 10% of bulk crystal values but should improve with finer tuning of deposition and annealing parameters. By Wavelength Dispersive Electron Probe Microanalysis and optical absorption analysis, it was shown that the composition of films with 0.2 to 0.27 mole % CdTe could be the same as the effective x-value of the targets, which were made from a pressed powder mixture of HgTe and CdTe. GRA

**N83-18537#** Sandia Labs., Albuquerque, N. Mex.

**LIQUID PHASE EPITAXY TECHNIQUES FOR COMPOUND SEMICONDUCTOR GROWTH**

L. R. Dawson 1982 16 p refs Presented at the SPIE Opt. Coatings for Energy Efficiency and Solar Appl. Conf., Los Angeles, 25 Jan. 1982
(Contract DE-AC04-76DP-00789)
(DE82-006299; SAND-82-0025C; CONF-820107-4) Avail: NTIS HC A02/MF A01

Liquid phase epitaxy (LPE) is method of crystal growth well suited to the preparation of a wide range of compound semiconductor materials, including GaAs, AlAs, GaP, InP, and GaSb, as well as their ternary and quaternary alloys. The advantages of LPE over other solution growth methods are substantial, primarily in material purity, doping flexibility, and dimensional control. It has particular advantages in achieving the complex multilayer structures required for many interesting optical devices, such as injection lasers, light emitting diodes, and photodetectors. LPE has appeared in many configurations in recent years, with the dominant variation at present being the sliding boat method. A good understanding of the capabilities of this method can be obtained by studying the growth of GaAs-Al/sub x/Ga/sub 1-x/As heterostructures. DOE

**N83-18538#** National Research Council of Canada, Ottawa (Ontario). Div. of Physics.

**CURVED CRYSTAL STUDY OF DE-EXCITATION GAMMA RAYS IN 184W FOLLOWING NEUTRON CAPTURE**

W. F. Davidson, C. W. Reich (EG&G Idaho, Inc., Idaho Falls), R. C. Greenwood (EG&G Idaho, Inc., Idaho Falls), and H. R. Koch (Kernfoschunsalage Juelich) 1981 2 p refs Presented at the 4th Intern. Symp. on Neutron-Capture Gamma-Ray Spectry. and Related Topics, Grenoble, France, 7 Sep. 1981
(Contract DE-AC07-76ID-01570)
(DE82-007351; EGG-M-05881; CONF-810920-20) Avail: NTIS HC A02/MF A01

The capture gamma-ray spectrum was studied using the curved-crystal gamma-ray spectrometers installed at the high flux reactor of the ILL in Grenoble. Approximately 150 gamma-ray transitions, from approximately 85 keV to 2.33 Mev, were assigned to W-184. A partial level scheme of W-184, showing the first four excited positive-parity bands and their de-exciting gamma-ray transitions as observed in this study, is shown. DOE

**N83-18539#** Hanford Atomic Products Operation, Richland, Wash.

**COMPUTER SIMULATION OF HIGH-ENERGY RECOILS IN FCC METALS: CASCADE SHAPES AND SIZES**

H. L. Heinisch 1981 6 p refs Presented at the 2nd Topical Meeting on Fusion Reactor Mater., Seattle, 9-12 Aug. 1981
(Contract DE-AC06-76FF-02170)
(DE82-006032; HEDL-SA-2504-FP; CONF-810831-83) Avail: NTIS HC A02/MF A01

Displacement cascades in copper generated by primary knock-on atoms with energies from 1 keV to 500 keV were produced with the computer code MARLOWE. The sizes and other features of the point defect distributions were measured as a function of energy. In the energy range from 30 keV to 50 keV there is a transition from compact single damage regions to chains of generally closely-spaced, but distinct multiple damage regions. The average spacing between multiple damage regions remains constant with energy. Only a small fraction of the recoils from fusion neutrons is expected to produce widely separated subcascades. DOE

**N83-18540#** Oak Ridge National Lab., Tenn.

**PLANAR CHANNELING OF IONS IN COMPOUND SEMICONDUCTOR SUPERLATTICES**

John H. Barrett Jan. 1982 11 p refs Presented at the 9th Ann. Conf. on Phys. and Chem. of Semiconductor Interfaces, Pacific Grove, Calif., 27 Jan. 1982 Submitted for publication
(Contract W-7405-eng-26)
(DE82-010201; CONF-820124-1) Avail: NTIS HC A02/MF A01

Computer simulations have been done to show how planar

channeling of high energy ions in compound semiconductor superlattices offers a further means of studying structure at the interfaces in these materials. Such a technique will supplement earlier work with axial channeling concerning offsets at the interfaces in rows of atoms inclined to the surface normal. The method involves having the interface of a depth of 10 to 20 nm and adjusting the ion energy so that the ions travel about a quarter wave length in reaching the interface. The tilt angle of the beam relative to the planar channel can be varied to sweep the beam across the channel and make a precise determination of the offset position. This procedure can provide a confirmation of the offset and a more accurate determination of its size. DOE

**N83-18541#** Brookhaven National Lab., Upton, N. Y.
**RADIATION DAMAGE IN SEMICONDUCTOR DETECTORS**
H. W. Kraner Dec. 1981 18 p refs Presented at the IEEE Symp. on Nucl. Sci., San Francisco, 21-23 Oct. 1981
(Contract DE-AC02-76CH-00016)
(DE82-010248; BNL-30616; CONF-811012-56) Avail: NTIS HC A02/MF A01

A survey is presented of the important damage producing interactions in semiconductor detectors and estimates of defect numbers are made for MeV protons, neutrons, and electrons. Damage effects of fast neutrons in germanium gamma ray spectrometers are given in some detail. General effects in silicon detectors are disscussed and damage constants and their relationships to leakage current are introduced. DOE

**N83-18542#** Brookhaven National Lab., Upton, N. Y.
**INTERNAL FRICTION AND YOUNG'S MODULUS OF Nb3Sn BETWEEN 6 AND 300 K**
B. Faucher (National Research Council of Canada), J. F. Bussiere (National Research Council of Canada), C. L. Snead, Jr., and M. Suenaga 1981 8 p refs Presented at the Intern. Conf. on Internal Friction and Ultrasonic Attenuation in Solids, Lausanne, Switzerland, 6-9 Jul. 1981
(Contract DE-AC02-76CH-00016)
(DE82-010622; BNL-30667; CONF-810717-2) Avail: NTIS HC A02/MF A01

Young's modulus and internal friction were measured in polycrystalline Nb3Sn between 6 and 300K. Below the martensitic tranformation temperature a large rise in internal friction is observed, in agreement with recent observations. In this temperature range, the internal friction is found to be nearly independent of frequency domains of the tetragonal phase as the main source of relaxation. Internal friction peaks observed at 140 and 260K in Nb/Nb3Sn composite tapes are tentatively attributed respectively to an alpha peak in Nb and hydrogen in the Nb3Sn layer. Annealing at 750 C for 1/2h is found to decrease the transformation temperature from 49 to 40K, and to modifying the softening of Young's modulus in this temperature range. Young's modulus at 6K s 46% of room temperature value is unchanged by the annealing treatment. DOE

**N83-18543#** Columbia Univ., New York. School of Mines.
**IONIC CONDUCTIVITY OF CeO2 WITH TRIVALENT DOPANTS OF DIFFERENT IONIC RADII**
R. Gerhardt-Anderson and A. S. Nowick 1981 4 p refs
(Contract DE-AS02-78ER-04693)
(DE82-007511; DOE/ER-04693/10) Avail: NTIS HC A02/MF A01

The ionic conductivity, sigma, of dilute CeO2:M2O3 solid solutions was investigated for four different dopants M(3+), viz., La(3+), Gd(3+) and Sc(3+). Conductivity does not vary monotonically with dopant radius but is a maximum for Gd(3+) doping. The association energy, H sub A, of the MV sub O pairs (V sub O = oxygen-ion vacancy) varies in an inverse manner to sigma. For Sc(3+) doped samples, sigma is approximately 1000 times lower than for the other dopants. Double doping experiments also show that Sc(3+) acts as a scavenger for vacancies. After considering other models, it is concluded that the behavior of Sc can only be explained by the formation of ScV sub O pairs of very high association energy. DOE

**N83-18544#** Columbia Univ., New York. School of Mines.
**DIELECTRIC RELAXATION FROM A NETWORK OF CHARGED DEFECTS IN DILUTE CeO2:Y2O3 SOLID SOLUTIONS**
Da Yu Wang and A. S. Nowick 1981 4 p refs
(Contract DE-AS02-78ER-04693)
(DE82-007212; DOE/ER-04693/11) Avail: NTIS HC A02/MF A01

Solid solutions of Y2O3 in CeO2 are examined by the thermal depolarization (or ITC) method of dielectric relaxation. For concentrations < or = 1 m/o Y2O3, two peaks are observed. The lower temperature peak is interpreted as due to the relaxation of nn YV sub o pairs (where V sub o = oxygen vacancy) and is analogous to the well known CaV sub o pair obtained with Ca(2+) doping. The upper peak, on the other hand, is a broad peak whose position is a function of concentration. It is not due to simple dipoles, but originates in the network of alternately charged (YV sub o) pairs and isolated Y' defects by redistribution of vacancies. DOE

**N83-18545#** Sandia Labs., Albuquerque, N. Mex.
**OCTAHEDRAL SITE OCCUPATION IN LANTHANUM DIHYDRIDE**
E. L. Venturini 1982 6 p refs Presented at the Intern. Symp. on the Electron. Structure and Properties of Hydrogen in Metals, Richmond, Va., 4 Mar. 1982
(Contract DE-AC04-76DP-00789)
(DE82-008467; SAND-82-0168C; CONF-820325-1) Avail: NTIS HC A02/MF A01

The distribution of hydrogen ions among the octahedral and tetrahedral sites in lanthanum hydride was determined at liquid helium temperatures for hydrogen/metal ratios from 1.90 to 2.04. Electron spin resonance spectra of dilute erbium ions substituted for host metal atoms establish the hydrogen site occupation adjacent to the erbium versus hydrogen loading. These data together with a lattice-gas calculation yield the site occupation versus hydrogen concentration in bulk lanthanum hydride, which is such that 2% of the octahedral sites are filled in LaH200. DOE

**N83-18546#** Los Alamos Scientific Lab., N. Mex.
**INDUCED COMPTON-SCATTERING EFFECTS IN RADIATION-TRANSPORT APPROXIMATIONS Thesis**
Donald Richey Gibson, Jr. Feb. 1982 149 p refs
(Contract W-7405-eng-36)
(DE82-009726; LA-9193-T) Avail: NTIS HC A07/MF A01

The method of characteristics is used to solve radiation transport problems with induced Compton scattering effects included. The introduction of induced scattering into the radiation transport equation results in a quadratic nonlinearlity. Methods are developed to solve problems in which both linear and nonlinear Compton scattering are important. Solutions to scattering problems are found for a variety of initial photon energy distributions. DOE

# 77 THERMODYNAMICS AND STATISTICAL PHYSICS

Includes quantum mechanics; and Bose and Fermi statistics.

For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer.*

**N83-18547** Technion - Israel Inst. of Tech., Haifa. Dept. of Aeronautical Engineering.
**IDEAL GAS THERMODYNAMIC FUNCTIONS OF HYDRIDES AND DEUTERIDES, PART 1**
Alexander Burcat Jun. 1980 80 p refs
(TAE-411-Pt-1) Copyright.. Avail: Issuing Activity

Thermochemical tables of some deuterides and their respective hydrides are presented in the JANAF type format for the temperature range 0 to 6000 K. The tables include the following species: D, H, D2, H2, HD, CD, CH, CD2, CH2, CD3, CH3, CD4, CD3H,

CD2H2, CDH3, CH4, C2D4, C2H4, C2H6, OD, OH, H20, D20, HDO, CDO and CHO. All the tables are in SI units. NASA type polynomials of the thermodynamic properties are also presented. M.G.

**N83-18548#** Rochester Univ., N. Y. Dept. of Mechanical Engineering.
**THERMODYNAMICS OF PHASE-TRANSFORMATION TOUGHENING**
S. J. Burns and J. R. Michener 1981 13 p refs Presented at the Intern. Symp. on the Fracture Mech. of Ceramics, University Park, Pa., 15 Jul. 1981
(Contract DE-AC02-81ER-10856)
(DE82-006247; DOE/ER-10856-1; CONF-810746-4) Avail: NTIS HC A02/MF A01

Phase transformation toughening is strongly related to the negative coefficient of thermal expansion and the volume contraction in the phase transformation in ZrO2. The effect is the opposite of the embrittlement in ordinary phase transformations. Without a negative volume change upon heating or a positive volume change upon cooling the material would not be fracture toughened. DOE

**N83-18549#** Washington Univ., Seattle. Dept. of Physics.
**GRAVITY AS A DYNAMICAL CONSEQUENCE OF THE STRONG, WEAK, AND ELECTROMAGNETIC INTERACTIONS**
A. Zee Dec. 1981 17 p refs Presented at the Erice Conf., Italy, Oct. 1981
(Contract DE-AC06-81ER-40048)
(DE82-020190; DOE/ER-40048-82/PT8) Avail: NTIS HC A02/MF A01

The possiblity of coherent and reasonable account of gravitational physics is shown. The three nongravitational interactions are described by a scale and conformal invariant and asymptotically free Yang-Mills theory with massless fermions. Conformal invariance is required to give the gravitational sector of the theory by the Weyl action. The theory can be normalized and has a unitary S-matrix. Possible breakdown of causality is observed, however only at the Planck length. Einstein's theory of gravity is induced as an effective long distance theory. An R(2) term is also induced with a finite and physically desired sign. DOE

**N83-18550#** Colorado School of Mines, Golden. Dept. of Chemical and Petroleum Refining Engineering.
**ENTHALPY MEASUREMENT OF COAL-DERIVED LIQUIDS Technical Progress Report, Aug. 1981 - Jan. 1982**
A. J. Kidnay and V. F. Yesavage 1 Apr. 1982 111 p refs
(Contract DE-AC22-81PC-40787)
(DE82-012307; DOE/PC-40787/T1) Avail: NTIS HC A06/MF A01

The compound quinoline is discussed. Process flow in the flow calorimeter, operational problems, and equipment modifications are described. Procedural modifications, including a sample purification procedure, are described. Quinoline enthalpy data are presented along the isobars of 517.1, 689.5, 1034.2, 1379.0, 3799.s1, and 10342.5 kPa over a temperature range of 340 to 664 K. Experimental enthalpy values and thermodynamic properties derived from this data are compared to corresponding values found in the literature, and to values predicted using computer aided calculations involving three correlations. The three correlations are: the SRK equation of state, and two modifications of the BWR equation of state, and Starling, respectively. DOE

# 80 SOCIAL SCIENCES (GENERAL)

Includes educational matters.

No abstracts in this category.

# 81 ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

**N83-18551*#** National Aeronautics and Space Administration, Washington, D. C.
**MANAGING NASA IN THE APOLLO ERA**
Arnold S. Levine 1982 359 p refs
(NASA-SP-4102; NAS 1.21:4102) Avail: NTIS HC A16/MF A01 CSCL 05A

The administration and organization are described and analyzed. Policies on manpower and the budgetary process for contracting for research development, the structure of NASA-DOD relations, and program planning are discussed. S.L.

**N83-18552#** Technical Research Centre of Finland, Espoo. Textile Lab.
**AN APPROACH TO A COORDINATING MODEL OF THE MANAGING PROCESS AND TECHNIQUES OF APPLIED MATHEMATICS Ph.D. Thesis - Helsinki Univ. of Technol.**
Ben Malmstroem Apr. 1982 180 p refs
(VTT-RR-82; ISBN-951-38-1496-3; ISSN-0358-5077) Avail: NTIS HC A09/MF A01

The theoretical deduction of a concept or model with the ability to represent the formal managing process and, on the other hand, to adapt common management techniques of applied mathematics is considered. The business firm is considered an open system where activities are thought of as outputs from and inputs to primary elements forming the real system structure and hierarchy. The operations form interacting activity programs, and it is found that these time series constitute a common denominator on the basis of which a comprehensive model can be built. The projected double entry account conception is developed as a deduction which has the ability to picture the activity and structure of the real business system, to represent the effect of the formal managing process, and to adapt common management techniques of applied mathematics. The projected account for industrial transformation processes seems to be the key invention which allows a consistent build-up of the theoretical model. Finally some features and further developments of the theoretical concept are discussed. Author

**N83-18553#** Massachusetts Inst. of Tech., Cambridge. Lab. for Information and Decision Systems.
**DECISIONMAKING ORGANIZATIONS WITH ACYCLICAL INFORMATION STRUCTURES**
Alexander H. Levis and Kevin L. Boettcher Aug. 1982 11 p refs
(Grant AF-AFOSR-0229-80; AF Proj. 2304)
(AD-A121185; LIDS-P-1225; AFOSR-82-0950TR) Avail: NTIS HC A02/MF A01 CSCL 05/10

An analytical model of a team of well-trained human decisionmakers executing a well-defined decisionmaking task is presented. Each team member is described by a two-stage model consisting of a situation assessment and a response selection stage. An information theoretic framework is used in which bounded rationality is modeled as a constraint on the total rate of internal processing by each decisionmaker. Optimizing and satisfying strategies are derived and their properties analyzed in terms of organizational performance and individual workload. The results are applied to the analysis and evaluation of two three-person organizational designs. GRA

**N83-18554#** Woodard-Clyde Consultants, San Francisco, Calif.
**DECISION FRAMEWORK FOR TECHNOLOGY CHOICE. VOLUME 1. A CASE STUDY OF ONE UTILITY'S COAL-NUCLEAR CHOICE**
R. L. Keeney, J. R. Beley, P. Fleischauer, C. W. Kirkwood, and A. Sicherman Dec. 1981 247 p refs 2 Vol.
(EPRI Proj. 1433-1)
(DE82-902213; EPRI-EA-2153-Vol-1) Avail: NTIS HC A11/MF A01

A method designed to assist the utility industry in making technology choices in a logically consistent manner is presented. The result evaluation model is based on the principles of decision analysis. The evaluation model and its components are discussed and its application is demonstrated using a coal nuclear choice. The case study is only meant to be illustrative and its purpose is to demonstrate the methodology. DOE

**N83-18555#** Department of Energy, Washington, D. C. Office of Nuclear Power Systems.
**PROGRAM MANAGEMENT PLAN FOR THE CONDUCT OF A RESEARCH, DEVELOPMENT AND DEMONSTRATION PROGRAM FOR IMPROVING THE SAFETY OF NUCLEAR POWERPLANTS**
Dec. 1981 15 p
(DE82-008776; DOE/NE-0032) Avail: NTIS HC A02/MF A01

Public Law 96-567, Nuclear Safety Research Development, and Demonstration Act of 1980, (the Act) which provides for an accelerated and coordinated program of light water reactor safety research, development, and demonstration is discussed. The Department of Energy (DOE) initiated its response to Section 4 of the Act by conducting individual information gathering meetings with Nuclear Regulatory Commission (NRC) and a wide cross section of the nuclear industry. Needs of type of activities were recommended. It is concluded that the Department's ongoing Light Water Reactor (LWR) safety program is responsive to the Act. The Department's ongoing program includes tasks in the areas of regulatory assessment, risk assessment, fission product source term, and emergency preparedness as well as providing technical assistance to the Institute of Nuclear Power Operations (INPO) to improve training of nuclear power personnel. DOE

# 82 DOCUMENTATION AND INFORMATION SCIENCE

Includes information storage and retrieval technology; micrography; and library science.

For computer documentation see *61 Computer Programming and Software.*

**N83-18556** Library of Congress, Washington, D. C.
**ONLINE PUBLIC ACCESS CATALOGS: THE USER INTERFACE**
Charles R. Hildreth 1982 275 p Sponsored by Council on Library Resources
(LC-82-8224; ISBN-0-933418-34-5) Copyright. Avail: Issuing Activity

The features and command languages of ten online public access library catalogs (OPACs) are discussed. The fundamental components of the user system interface in interactive systems are covered. Author

**N83-18557*#** OAO Corp., Greenbelt, Md.
**ADS PILOT PROGRAM PLAN**
J. Clauson and J. Heuser Feb. 1981 57 p
(Contract NASw-3358)
(NASA-CR-169829; NAS 1.26:169829; OAO/TR-81/0021) Avail: NTIS HC A04/MF A01 CSCL 05B

The Applications Data Service (ADS) is a system based on an electronic data communications network which will permit scientists to share the data stored in data bases at universities and at government and private installations. It is designed to allow users to readily locate and access high quality, timely data from multiple sources. The ADS Pilot program objectives and the current plans for accomplishing those objectives are described. Author

**N83-18558*#** OAO Corp., Hampton, Va.
**RELATION OF NEEDS TO OSTA Final Report**
Feb. 1981 86 p refs
(Contract NASw-3358)
(NASA-CR-169825; NAS 1.26:169825; OAO/TR-81/0058) Avail: NTIS HC A05/MF A01 CSCL 05B

The NEEDS program was examined, the interfaces between OSTA and NEEDS were identified, and the responsiveness of the NEEDS program to OSTA technological requirements were assessed. Existing and planned NEEDS elements are discussed. Author

**N83-18559*#** National Aeronautics and Space Administration, Washington, D. C.
**NASA ADMINISTRATIVE DATA BASE MANAGEMENT SYSTEMS**
Jan. 1983 285 p refs Conf. held in Pasadena, Calif., 26-27 May 1982
(NASA-CP-2254; NAS 1.55:2254) Avail: NTIS HC A13/MF A01 CSCL 05B

Various issues concerning administrative data base management systems are discussed. The procurement and operation of several systems are discussed. For individual titles, see N83-18560 through N83-18576.

**N83-18560*#** Jet Propulsion Lab., California Inst. of Tech., Pasadena.
**DATABASES AS AN INFORMATION SERVICE**
Don A. Vincent *In* NASA, Washington NASA Admin. Data Base Management Systems Jan. 1983 p 3-10 (For primary document see N83-18559 08-82)
Avail: NTIS HC A13/MF A01 CSCL 05B

The relationship of databases to information services, and the range of information services users and their needs for information is explored and discussed. It is argued that for database information to be valuable to a broad range of users, it is essential that access methods be provided that are relatively unstructured and natural to information services users who are interested in the information contained in databases, but who are not willing to learn and use traditional structured query languages. Unless this ease of use of databases is considered in the design and application process, the potential benefits from using database systems may not be realized. R.J.F.

**N83-18561*#** Jet Propulsion Lab., California Inst. of Tech., Pasadena.
**COMPARISON OF SCIENTIFIC AND ADMINISTRATIVE DATABASE MANAGEMENT SYSTEMS**
Joseph C. Stoltzfus *In* NASA, Washington NASA Admin. Data Base Management Systems Jan. 1983 p 11-15 (For primary document see N83-18559 08-82)
Avail: NTIS HC A13/MF A01 CSCL 05B

Some characteristics found to be different for scientific and administrative data bases are identified and some of the corresponding generic requirements for data base management systems (DBMS) are discussed. The requirements discussed are especially stringent for either the scientific or administrative data bases. For some, no commercial DBMS is fully satisfactory, and the data base designer must invent a suitable approach. For others, commercial systems are available with elegant solutions, and a wrong choice would mean an expensive work-around to provide the missing features. It is concluded that selection of a DBMS must be based on the requirements for the information system. There is no unique distinction between scientific and administrative data bases or DBMS. The distinction comes from the logical structure of the data, and understanding the data and their relationships is the key to defining the requirements and selecting an appropriate DBMS for a given set of applications. R.J.F.

**N83-18562*#** National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
**USER INTERFACE TO ADMINISTRATIVE DRMS WITHIN A DISTRIBUTED ENVIRONMENT**
Lowell D. Martin and Robert D. Kirk (Boeing Computer Support Services, Inc.) *In* NASA, Washington NASA Admin. Data Base Management Systems Jan. 1983 p 16-34 (For primary document see N83-18559 08-82)
Avail: NTIS HC A13/MF A01 CSCL 05B

The implementation of a data base management system (DBMS) into a communications office to control and report on communication leased service contracts is discussed. The system user executes online programs to update five files residing on a UNIVAC 1100/82, through the forms mode features of the Tektronix 4025 terminal and IMSAI 8080 microcomputer. This user can select the appropriate form to the Tektronix 4025 screen, and enter new data, update existing data, or discontinue service. Selective online printing of 40 reports is accomplished by the system user to satisfy management, budget, and bill payment reporting requirements.
R.J.F.

**N83-18563*#** Jet Propulsion Lab., California Inst. of Tech., Pasadena.
**DOCU-TEXT: A TOOL BEFORE THE DATA DICTIONARY**
Barbara Carter *In* NASA, Washington NASA Admin. Data Base Management Systems Jan. 1983 p 35-50 (For primary document see N83-18559 08-82)
Avail: NTIS HC A13/MF A01 CSCL 05B

DOCU-TEXT, a proprietary software package that aids in the production of documentation for a data processing organization and can be installed and operated only on IBM computers is discussed. In organizing information that ultimately will reside in a data dictionary, DOCU-TEXT proved to be a useful documentation tool in extracting information from existing production jobs, procedure libraries, system catalogs, control data sets and related files. DOCU-TEXT reads these files to derive data that is useful at the system level. The output of DOCU-TEXT is a series of user selectable reports. These reports can reflect the interactions within a single job stream, a complete system, or all the systems in an installation. Any single report, or group of reports, can be generated in an independent documentation pass. R.J.F.

**N83-18564*#** Mitre Corp., Bedford, Mass.
**DBMS UTILIZATION: A CORPORATE INFORMATION SYSTEM (CIS) DEVELOPMENT APPROACH**
Peter Rozett *In* NASA, Washington NASA Admin. Data Base Management Systems Jan. 1983 p 51-76 (For primary document see N83-18559 08-82)
Avail: NTIS HC A13/MF A01 CSCL 05B

The Corporate Information System (CIS), an integrated information system intended to tie the corporation together as a functioning entity, is described. In addition to being a major upgraded automated data processing system, the CIS is a management philosophy which recognizes data as a valuable corporate resource and which distinguishes between data and selected data, or information. It further recognizes that different users need different kinds of information. Plans for CIS development are discussed. It will offer its users not just after-the-fact data, but timely information in a format that is meaningful and useful to the particular user, so that the information can be applied in planning, controlling, and decision making by all levels of management. In effect, CIS will help the corporation itself to function as a total, integrated system by typing together administrative activities through information exchange. The CIS supports the operational, tactical control, and strategic planning functions of the corporation. Operational functions are the day-to-day processing necessary to support the corporation's work, such as purchasing and payroll.
R.J.F.

**N83-18565*#** Mitre Corp., Bedford, Mass.
**DATABASE MACHINES**
Malcolm L. Stiefel *In* NASA, Washington NASA Admin. Data Base Management Systems Jan. 1983 p 77-889 refs (For primary document see N83-18559 08-82)
Avail: NTIS HC A13/MF A01 CSCL 05B

The functions and performance characteristics of data base machines (DBM), including machines currently being studied in research laboratories and those currently offered on a commerical basis are discussed. The cost/benefit considerations that must be recognized in selecting a DBM are discussed, as well as the future outlook for such machines. R.J.F.

**N83-18566*#** Computer Sciences Corp., Orlando, Fla.
**COMPARATIVE ANALYSIS OF DATA BASE MANAGEMENT SYSTEMS**
Rod Smith *In* NASA, Washington NASA Admin. Data Base Management Systems Jan. 1983 p 90-99 (For primary document see N83-18559 08-82)
Avail: NTIS HC A13/MF A01 CSCL 05B

A study to determine if the Remote File Inquiry (RFI) system would handle the future requirements of the user community is discussed. RFI is a locally written and locally maintained on-line query/update package. The current and future on-line requirements of the user community were studied. Additional consideration was given to the types of data structuring the users required. The survey indicated the features of greatest benefit were: sort, subtotals, totals, record selection, storage of queries, global updating and the ability to page break. The major deficiencies were: one level of hierarchy, excessive response time, software unreliability, difficult to add, delete and modify records, complicated error messages and the lack of ability to perform interfield comparisons. Missing features users required were: formatted screens, interfield comparions, interfield arithmetic, multiple file access, security and data integrity. The survey team recommended Kennedy Space Center move forward to state-of-the-art software, a Data Base Management System which is thoroughly tested and easy to implement and use. R.J.F.

**N83-18567*#** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
**RAMIS**
Jim Head *In* NASA, Washington NASA Admin. Data Base Management Systems Jan. 1983 p 100-154 (For primary document see N83-18559 08-82)
Avail: NTIS HC A13/MF A01 CSCL 05B

A description is given of experience with the RAMIS data base management system. Examples are given of tasks where the user friendly aspects of the system facilitated quick handling of inquiries. R.J.F.

**N83-18568*#** National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
**RIMS: RESOURCE INFORMATION MANAGEMENT SYSTEM**
Jon Symes *In* NASA, Washington NASA Admin. Data Base Management Systems Jan. 1983 p 155-189 (For primary document see N83-18559 08-82)
Avail: NTIS HC A13/MF A01 CSCL 05B

An overview is given of the capabilities and functions of the resource management system (RIMS). It is a simple interactive DMS tool which allows users to build, modify, and maintain data management applications. The RIMS minimizes programmer support required to develop/maintain small data base applications. The RIMS also assists in bringing the United Information Services (UIS) budget system work inhouse. Information is also given on the relationship between the RIMS and the user community. B.W.

**N83-18569*#** National Aeronautics and Space Administration, Washington, D. C.
**OVERVIEW OF THE INTEGRATED PROGRAMS FOR AEROSPACE VEHICLE DESIGN (IPAD) PROJECT**
Sam L. Venneri *In its* NASA Admin. Data Base Management Systems Jan. 1983 p 1910203 (For primary document see N83-18559 08-82)
Avail: NTIS HC A13/MF A01 CSCL 05B

To respond to national needs for improved productivity in engineering design and manufacturing, a NASA supported joint industry/government project is underway denoted Integrated Programs for Aerospace Vehicle Design (IPAD). The objective is to improve engineering productivity through better use of computer technology. It focuses on development of data base management technology and associated software for integrated company wide management of engineering and manufacturing information. Results to date on the IPAD project include an in depth documentation of a representative design process for a large engineering project, the definition and design of computer aided design software needed

to support that process, and the release of prototype software to manage engineering information. This paper provides an overview of the IPAD project and summarizes progress to date and future plans. B.W.

**N83-18570*#** Jet Propulsion Lab., California Inst. of Tech., Pasadena.
**PLANNING THE FUTURE OF JPL'S MANAGEMENT AND ADMINISTRATIVE SUPPORT SYSTEMS AROUND AN INTEGRATED DATABASE**
Michaelk M. Ebersole *In* NASA, Washington NASA Admin. Data Base Management Systems Jan. 1983 p 204-215 ref (For primary document see N83-18559 08-82)
Avail: NTIS HC A13/MF A01 CSCL 05B

JPL's management and administrative support systems have been developed piece meal and without consistency in design approach over the past twenty years. These systems are now proving to be inadequate to support effective management of tasks and administration of the Laboratory. New approaches are needed. Modern database management technology has the potential for providing the foundation for more effective administrative tools for JPL managers and administrators. Plans for upgrading JPL's management and administrative systems over a six year period evolving around the development of an integrated management and administrative data base are discussed. Author

**N83-18571*#** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
**DESCRIPTION OF DATA BASE MANAGEMENT ACTIVITIES**
*In* NASA, Washington NASA Admin. Data Base Management Systems Jan. 1983 p 247-250 (For primary document see N83-18559 08-82)
Avail: NTIS HC A13/MF A01 CSCL 05B

ARC's current and future data processing needs have been identified and defined. Requirements for improved data processing capabilities are listed: (1) Centralized control of system data files. Establish a DBA/data base administrator position with responsibility for management of the Centers numerous data bases; (2) Programmer tools to improve efficiency of performance; (3) Direct and timely access to information. Presently, the user submits query requests to the data processing department where they are prioritized with other queries and then batch processed using a report generator; (4) On line data entry. With the merger of the Dryden facility with ARC on line data entry, edit and updates have become mandatory for timely operation and reporting. A DBMS software package was purchased to meet the above requirements. B.W.

**N83-18572*#** Jet Propulsion Lab., California Inst. of Tech., Pasadena.
**DESCRIPTION OF DATA BASE MANAGEMENT SYSTEMS ACTIVITIES**
*In* NASA, Washington NASA Admin. Data Base Management Systems Jan. 1983 p 251-254 (For primary document see N83-18559 08-82)
Avail: NTIS HC A13/MF A01 CSCL 05B

One of the major responsibilities of the JPL Computing and Information Services Office is to develop and maintain a JPL plan for providing computing services to the JPL management and administrative community that will lead to improved productivity. The CISO plan to accomplish this objective has been titled 'Management and Administrative Support Systems' (MASS). The MASS plan is based on the continued use of JPL's IBM 3032 Computer system for administrative computing and for the MASS functions. The current candidate administrative Data Base Management Systems required to support the MASS include ADABASE, Cullinane IDMS and TOTAL. Previous uses of administrative Data Base Systems have been applied to specific local functions rather than in a centralized manner with elements common to the many user groups. Limited capacity data base systems have been installed in microprocessor based office automation systems in a few Project and Management Offices using Ashton-Tate dBASE II. These experiences plus some other localized in house DBMS uses have provided an excellent background for developing user and system requirements for a single DBMS to support the MASS program. B.W.

**N83-18573*#** National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
**SHUTTLE PROGRAM INFORMATION MANAGEMENT SYSTEM (SPIMS) DATA BASE**
*In* NASA, Washington NASA Admin. Data Base Management Systems Jan. 1983 p 255-257 (For primary document see N83-18559 08-82)
Avail: NTIS HC A13/MF A01 CSCL 05B

The Shuttle Program Information Management System (SPIMS) is a computerized data base operations system. The central computer is the CDC 170-730 located at Johnson Space Center (JSC), Houston, Texas. There are several applications which have been developed and supported by SPIMS. A brief description is given. B.W.

**N83-18574*#** National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, Fla.
**DATA MANAGEMENT APPLICATIONS**
*In* NASA, Washington NASA Admin. Data Base Management Systems Jan. 1983 p 258-260 (For primary document see N83-18559 08-82)
Avail: NTIS HC A13/MF A01 CSCL 05B

Kennedy Space Center's primary institutional computer is a 4 megabyte IBM 4341 with 3.175 billion characters of IBM 3350 disc storage. This system utilizes the Software AG product known as ADABAS with the on line user oriented features of NATURAL and COMPLETE as a Data Base Management System (DBMS). It is operational under the OS/VSI and is currently supporting batch/on line applications such as Personnel, Training, Physical Space Management, Procurement, Office Equipment Maintenance, and Equipment Visibility. A third and by far the largest DBMS application is known as the Shuttle Inventory Management System (SIMS) which is operational on a Honeywell 6660 (dedicated) computer system utilizing Honeywell Integrated Data Storage I (IDSI) as the DBMS. The SIMS application is designed to provide central supply system acquisition, inventory control, receipt, storage, and issue of spares, supplies, and materials. B.W.

**N83-18575*#** National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
**DATA BASE MANAGEMENT SYSTEMS ACTIVITIES**
*In* NASA, Washington NASA Admin. Data Base Management Systems Jan. 1983 p 261-266 (For primary document see N83-18559 08-82)
Avail: NTIS HC A13/MF A01 CSCL 05B

The Data Management System-1100 is designed to operate in conjunction with the UNIVAC 1100 Series Operating System on any 1100 Series computer. DMS-1100 is divided into the following four major software components: (1) Data Definition Languages (DDL); (2) Data Management Routine (DMR); (3) Data Manipulation Languages (DML); and (4) Data Base Utilities (DBU). These software components are described in detail. B.W.

**N83-18576*#** National Aeronautics and Space Administration, Washington, D. C.
**AUTOMATION PILOT**
*In its* NASA Admin. Data Base Management Systems Jan. 1983 p 267-274 (For primary document see N83-18559 08-82)
Avail: NTIS HC A13/MF A01 CSCL 05B

An important concept of the Action Information Management System (AIMS) approach is to evaluate office automation technology in the context of hands on use by technical program managers in the conduct of human acceptance difficulties which may accompany the transition to a significantly changing work environment. The improved productivity and communications which result from application of office automation technology are already well established for general office environments, but benefits unique to NASA are anticipated and these will be explored in detail. B.W.

**N83-18577#** European Space Agency, Paris (France).
**THE SCIENTIFIC EDITOR IN THE ELECTRONIC AGE**
N. Longdon, ed. and G. Levy, ed. Aug. 1982 86 p refs Proc. of 5th ELSE/Editerra Gen. Assem. and Joint Conf., Pau, France, 11-14 May 1982; Sponsored by ESA and Elf Aquitaine
(ESA-SP-171; ISSN-0379-6566) Avail: NTIS HC A05/MF A01

Invited and contributed papers cover criteria for manuscript selection; nomenclature and standardization of terminology; indexing; and choice of language for scientific writing in the Earth and life sciences fields. The impact of word processors, bibliographic data bases, and computer based systems for information processing is discussed. For individual titles, see N83-18578 through N83-18585.

**N83-18578#** Elsevier Science Publishers, Amsterdam (Netherlands).
**ADONIS: AN AUTOMATED SYSTEM FOR DOCUMENT DELIVERY**
Arie A. Manten and Barrie T. Stern *In* ESA The Sci. Editor in the Electron. Age Aug. 1982 p 15-17 (For primary document see N83-18577 08-82)
Avail: NTIS HC A05/MF A01

The ADONIS document-delivery system is supported by a number of publishing houses and is scheduled to become operational in 1984. It is based on images of scientific, technical and medical journal-article pages, including illustrations, which are stored on optical recording discs. The system is further comprised of a high-speed scanner and printer and special computer software connecting these devices. ADONIS will provide a high-quality, rapid-delivery source of documents free of copyright problems for librarians. Author

**N83-18579#** Helsinki Univ. (Finland). Dept. of Geography.
**PROBLEMS OF SMALL-SCALE EDITING**
Paul Fogelberg *In* ESA The Sci. Editor in the Electron. Age Aug. 1982 p 19-20 (For primary document see N83-18577 08-82)
Avail: NTIS HC A05/MF A01

Different kinds of small-scale editors include honorary editors, editors of specialized international (mostly small-circulation) journals, editors of national society publications, and editors of local (grey) publications. The problems of these editors are quite different from those of the more professional people; these latter individuals, in turn, frequently do not have an understanding of the problem of small-scale editors. Some of the small-scale editors are able to develop considerable editorial skills, but others do their editorial work more or less as a routine effort, and without devotion. The number of publications edited by the last type of editor is, however, considerable, and many problems related to publishing arise from the dilettantism of certain editors. Author

**N83-18580#** Bureau de Recherches Geologiques et Minieres, Orleans (France).
**GEOLOGICAL INFORMATION: THE BIBLIOGRAPHIC DATA BASE PASCAL-GEODE AND THE INTERNATIONAL NETWORK FOR GEOLOGICAL INFORMATION**
J. Gravesteijn *In* ESA The Sci. Editor in the Electron. Age Aug. 1982 p 21-25 (For primary document see N83-18577 08-82)
Avail: NTIS HC A05/MF A01

The result of an international cooperation, grouping scientific information centers in Europe and the United States, the PASCAL-GEODE data base can be accessed on-line through ESA/IRS and Telesystemes-Questel. The problems occuring in international cooperation are illustrated and examples of difficulties in common indexing and classification are given. A.R.H.

**N83-18581#** Ohio State Univ., Columbus.
**A GEOLOGIST'S VENTURE INTO LEXICOGRAPHY**
Robert L. Bates *In* ESA The Sci. Editor in the Electron. Age Aug. 1982 p 27-28 (For primary document see N83-18577 08-82)
Avail: NTIS HC A05/MF A01

For a revision of the American Geological Institute's Glossary of Geology (1972), some 50,000 terms were considered and 36,000 were selected for publication. Nearly 150 geoscientists, specialists in their fields, took time to modify and update existng definitions and to propose new terms for inclusion. The science editor ensured that the definitions accepted were clear, concise, and grammatical, as well as reasonably consistent in format. Corrections and additions were processed by computer, and eventually magnetic tapes were used to produce camera-ready copy by a photocomposition process. The new edition appeared in 1980. A.R.H.

**N83-18582#** Uppsala Univ. (Sweden).
**THE SCIENTIFIC EDITOR AND THE CREATION OF NEW LANGUAGE**
Anders Martinsson *In* ESA The Sci. Editor in the Electron. Age Aug. 1982 p 29-31 (For primary document see N83-18577 08-82)
Avail: NTIS HC A05/MF A01

There is an increasing demand for standardization in terminology and nomenclature, but the traditional and still very applicable basis for such standardization tends to be forgotten or neglected. This base consists of a very limited set of grammatical rules and etymological lines leading to English and other modern languages. The tendency is rather to accept new terms and names in whatever non-linguistic form they first appeared and treat and memorize them as individual cases. The editor's attention and guidance is needed for more systematic creation of new language. Author

**N83-18583#** Acumation Ltd., London (England).
**THE IMPACT OF ELECTRONIC TECHNOLOGY ON THE PRODUCTION OF SCIENTIFIC MANUSCRIPTS**
J. Thomas *In* ESA The Sci. Editor in the Electron. Age Aug. 1982 p 33-46 (For primary document see N83-18577 08-82)
Avail: NTIS HC A05/MF A01

Trends in the development of electronic information processing systems that are relevant to the production of scientific manuscripts are highlighted. The development of text processing systems is historically reviewed and their suitability at the present time for scientific documents is considered. Aspects of input, storage, output and distribution are examined. It is shown that an ideal system for the production of scientific manuscripts needs to incorporate features from data processing systems, computer assisted typesetting systems, and word processing. Manuscript production systems must be designed to take into account future interfaces with information storage, retrieval and expert systems. A.R.H.

**N83-18584#** Annals of Internal Medicine, Philadelphia, Pa.
**A COMPUTER-BASED SYSTEM FOR SELECTING MANUSCRIPT AND BOOK REVIEWERS AND MAINTAINING INVENTORY FOR A MEDICAL JOURNAL**
Kathleleen Case *In* ESA The Sci. Editor in the Electron. Age Aug. 1982 p 47-49 refs (For primary document see N83-18577 08-82)
Avail: NTIS HC A05/MF A01

In 1981 Annals of Internal Medicine received about 3000 manuscripts and books to be considered for publications or review. Reviews of 30% of this material was reviewed by about 1300 consultants. A computer based system was implemented to help select reviewers and maintain an inventory of manuscripts and books. The in-house Univac 90/30 computer and three types of software programs were used. Biographical data and lists of specialty fields for 3000 reviewers were entered. The Excerpta Medica subject classification system was used to code specialty fields. The inventory is maintained as an initial record entry followed by successive dates of action. Subject codes are keyed in through a terminal, and complete records for reviewers qualified to review material in those subject areas are displayed. A.R.H.

**N83-18585#** Meditext, Weybridge (England).
**PRODUCING A JOURNAL ON A WORD PROCESSOR**
Hugh deGlanville *In* ESA The Sci. Editor in the Electron. Age Aug. 1982 p 51-53 (For primary document see N83-18577 08-82)
Avail: NTIS HC A05/MF A01

The first production of an issue of a moderately complex 64-page monthly medical journal by interfacing an inexpensive word processor to a digital phototypesetter is described. All required

typesetting was done in-house and processed into galleys for paste-up without further manual intervention. A.R.H.

**N83-18586#** Politecnico di Milano (Italy). Lab. di Calcolatori.
**USER-ORIENTED DOCUMENT WRITER (UDW): USER'S MANUAL. VERSION 2.1: VAX/VMS**
A. Celentano Dec. 1981 81 p In ITALIAN Sponsored by CNR and Centro di Studio per l'Ingegneria dei Sistemi per l'Elaborazione delle Informazioni
(Rept-81-19) Avail: NTIS HC A05/MF A01

The user-oriented document writer (UDW) is described. Pagination and editorial commands; special characters; 'macrocommands'; conditional commands; standard format; execution of the UDC, FACIT, QUME, and SEE programs; and iterative procedure are discussed. Transl. by N.W.

**N83-18587#** Deutsche Bibliothek, Frankfurt (West Germany).
**THE ISDS NATIONAL CENTER OF THE DEUTSCHE BIBLIOTEK Final Report, Sep. 1981**
Dieter Wolf Bonn Bundesministerium fuer Forschung und Technologie Oct. 1982 71 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-ID-82-003; ISSN-0170-8996) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 15

The ISDS National Center of the Deutsche Bibliothek is outlined. The structure, function and purpose of the international Standard Serial Number (ISSN), and the conception, organization, and working method of the International Serials Data System (ISDS) are described. All information necessary to understand both the organization and purpose, as well as the development of the ISDS National Center as part of ISDS is presented. The five development phases which ISDS National Center went through, from its establishment until the discontinuation of financial assistance in 1979, are described. The development of the building and the work of the ISDS National Center from an economical point of view, how far the ISDS National Center has realized its four assigned projects, and expected use of the ISDS services in Germany are discussed. E.A.K.

# 83 ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

**N83-17468#** Eastern Air Lines, Inc., Atlanta, Ga.
**A PRACTICAL ECONOMIC CRITERION FOR FUEL CONSERVATION**
D. Roger Ferguson *In* DOE Symp. on Com. Aviation Energy Conserv. Strategies Apr. 1981 p 259-280 (For primary document see N83-17455 08-01)
Avail: NTIS HC A17/MF A01 CSCL 01/2

# 84 LAW AND POLITICAL SCIENCE

Includes space law; international law; international cooperation; and patent policy.

No abstracts in this category.

# 85 URBAN TECHNOLOGY AND TRANSPORTATION

Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.

For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

**N83-18588#** Committee on Banking, Housing and Urban Affairs (U. S. Senate).
**EAST-WEST TRADE AND TECHNOLOGY TRANSFER**
Washington GPO 14 Apr. 1982 133 p Hearing before the Subcomm. on Intern. Finance and Monetary Policy of the Comm. on Banking, Housing and Urban Affairs, 97th Congr., 2d Sess., 14 Apr. 1982
(GPO-96-791) Avail: Subcommittee on International Finance and Monetary Policy

East-West technology transfer is discussed. A number of important questions concerning Soviet attempts to overturn the military balance through East-West technology transfer is explored. The scope and nature of Soviet attempts to penetrate high technology industries in order to obtain the technology necessary to advance their military potential and the scope, nature, and relationship of high technology trade to the overall Soviet threat are considered. S.L.

**N83-18589#** Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany). Abteilung Flugverkehrswissenschaft.
**EFFECTS ON TRAFFIC OF A MAGNETIC LEVITATION SYSTEM, FRANKFURT TO PARIS**
Alfons Schmitt, Hermann Keimel, Gerd Wuerdemann, and Wilhelm Halten Jun. 1982 370 p refs In GERMAN; ENGLISH summary
(DFVLR-FB-82-18) Avail: NTIS HC A16/MF A01; DFVLR, Cologne DM 112

The volume and structure of passenger travel in the region under consideration for a situation without a Maglev system is analyzed. The substitutional effects of this system on the travel demand of airplane, train, and car and the generated traffic are estimated. A total of 6.6 million passenger trips per year on the Maglev system is expected, most of these coming from original passenger train traffic. On account of feeder services to the Maglev system, demand for the existing rail system is diminished by only 20%. Balances are struck for travel cost, travel time, and trip kilometers spent without and with case. Sensitivity analyses were carried out for supply variants of the Maglev system and the classic rail system. S.L.

**N83-18590*#** Jet Propulsion Lab., California Inst. of Tech., Pasadena.
**VEHICLE TEST REPORT: ELECTRIC VEHICLE ASSOCIATES ELECTRIC CONVERSION OF AN AMC PACER**
Theodore W. Price, Vincent A. Wirth, Jr., and Michael F. Pampa 15 Oct. 1981 60 p refs Sponsored in part by NASA
(Contract DE-AI01-78CS-54209)
(NASA-CR-169656; NAS 1.26:169656; DE82-005811; DOE/CS-54209/4) Avail: NTIS HC A04/MF A01 CSCL 13F

The change of pace, an electric vehicle was tested. These tests were performed to characterize certain parameters of the electric vehicle pacer and to provide baseline data that can be used for the comparison of improved batteries that may be incorporated into the vehicle at a later time. The vehicle tests were concentrated on the electrical drive subsystem, the batteries, controller and motor. Coastdowns to characterize the road load, and range evaluations for both cyclic and constant speed conditions were performed. The vehicle's performance was evaluated by comparing its constant speed range performance with described vehicles. It is found that the pacer performance is approximately

equal to the majority of the vehicles tested in the 1977 assessment. DOE

**N83-18591#** Los Alamos Scientific Lab., N. Mex. Technology Assessment Group.
**IMPACT OF FLYWHEEL-ENERGY-STORAGE TECHNOLOGY UPON TAXICAB FLEET OPERATION IN A LARGE METROPOLITAN CITY**
Milton C. Krupka and S. V. Jackson 1981 12 p refs Presented at the 4th Intern. Conf. on Alternative Energy Sources, Miami Beach, Fla., 14-16 Dec. 1981
(Contract W-7405-eng-36)
(DE82-002371; LA-UR-81-3071; CONF-811212-2) Avail: NTIS HC A02/MF A01

The incorporation of flywheel energy storage systems (FESS) into automotive vehicles has been under consideration for some time. Previous studies have suggested that FESS can yield substantial benefits in automotive vehicle operation, particularly for urban driving. An assessment of the impacts resulting from incorporation of FESS into automotive fleets in a large metropolitan city is described. Specifically, the case of taxicab fleet operation within New City is examined. Unique features of taxicab fleets are noted and taxicab operational characteristics within New York City are detailed. Based upon available New York City operational data, a levelized life-cycle cost comparison between a standard internal combustion engine vehicle (ICEV) in present use as a taxicab and a projected FESS/ICEV taxicab is generated. Energy-savings and environmental benefits are discussed, and potential institutional barriers to FESS implementation are identified. DOE

**N83-18592#** Comsis Corp., Wheaton, Md.
**OWNERSHIP AND USAGE OF SMALL PASSENGER VEHICLES: FINDINGS FROM THE 1977 NATIONAL PERSONAL TRANSPORTATION STUDY**
Dec. 1981 227 p
(Contract DE-AC01-80CS-50134)
(DE82-011045; DOE/CS-50134/T1) Avail: NTIS HC A11/MF A01

This report examines current patterns in the ownership and usage of small vehicles by private households. The analysis was conducted to shed additional light on the market potential for smaller, energy efficient vehicles, in particular, electric cars. The 1977 Nationwide Personal Transportation Survey (NPTS) was used to obtain information on the socio-demographic characteristics and the travel and vehicle ownership behavior of US households based on a national probability sample. The issues posed to direct the investigation of small vehicle ownership and use behavior include: the ownership of small vehicles; the proportion of the private vehicle population accounted for by small vehicles; how small and large vehicles compare in terms of physical characteristics and performance and terms of usage; and how small/large vehicle ownership and usage differences are explained by household differences or physical differences in the vehicles themselves. DOE

# 88 SPACE SCIENCES (GENERAL)

**N83-18593#** European Space Agency, Paris (France). Astronomy Div.
**GALACTIC AND EXTRAGALACTIC INFRARED SPECTROSCOPY**
M. F. Kessler, comp., J. P. Phillips, comp., and T. D. Guyenne, comp. Oct. 1982 101 p refs Proc. of 26th ESLAB Symp., Toledo, Spain, 6-8 Dec. 1982
(ESA-SP-192; ISSN-0379-6566) Avail: NTIS HC A06/MF A01

The application of infrared spectroscopy to astronomy is discussed. Recombination reactions, interstellar chemistry, cosmic dust, and atmospheric transmission in the near infrared are discussed. For individual titles, see N83-18594 through N83-18614.

**N83-18594#** Arizona Univ., Phoenix. Steward Observatory.
**LINE EXCESS OBJECTS: A NEW INFRARED SPECTROSCOPIC CLASS** c89
Roger I. Thompson *In* ESA Galactic and Extragalactic Infrared Spectroscopy Oct. 1982 p 7-10 refs (For primary document see N83-18593 08-88)
Avail: NTIS HC A06/MF A01

Near infrared spectroscopic studies of obscured objects in star formation regions yielded a new class of object. The new class is defined by an excess of emission in the Brackett lines of hydrogen over that expected from an H II region around a ZAMS star of the same luminosity. Very low or undetectable radio flux also characterizes the class. Other characteristics include broad lines and in some cases bipolar mass flows and distributions. Several theories were formulated to account for the properties of the class. The theories include stellar winds, viscous disks and deviations from case B recombinaton. The most likely theory which postulates ionization from the n = 2 level of hydrogen. Line excess objects are probably a major contributor to the supporting kinetic energy of molecular clouds. R.J.F.

**N83-18595#** Osservatorio Astrofisico di Arcetri, Florence (Italy).
**INFRARED SPECTROSCOPY OF P-CYGNI'S STELLAR WIND** c90
M. Felli, E. Oliva, A. Natta (CNR, Florence), R. Stanga (Florence Univ.), and S. Beckwith (Cornell Univ., Ithaca, New York) *In* ESA Galactic and Extragalactic Infrared Spectroscopy Oct. 1982 p 13-15 refs (For primary document see N83-18593 08-88)
Avail: NTIS HC A06/MF A01

Infrared spectroscopy of the early Br alpha, Br gamma, Pf beta, and Pf gamma lines with lambda/delta lambda approximately equals 800 is presented. The integrated line intensities and their relative ratios can be explained in terms of emission from an optically thick extended envelope created by the stellar mass loss. Constraints on the flow velocity in the region of the wind where the line emission occurs can be derived from the observed intensity ratios. The integrated line intensities, in conjunction with infrared and ratio continuum flux density measurements, can be used to determine the mass loss parameters. R.J.F.

**N83-18596#** Max-Planck-Institut fuer Astronomie, Heidelberg (West Germany).
**CVF SPECTRALPHOTOMETRY OF THE H2 REGION S 106** c89
C. Eiroa and H. Hefele (Astronomisches Recheninst.) *In* ESA Galactic and Extragalactic Infrared Spectroscopy Oct. 1982 p 17-20 refs (For primary document see N83-18593 08-88)
Avail: NTIS HC A06/MF A01

New 2-4 and 8-13 micron spectra of the bipolar nebula S 106 are reported, as well as observations of the lambda 12.8 micron NeII line and the 11.3 micron unidentified emission feature. HI recombination lines are observed at the infrared point source and in the optical lobes. The Ne line shows a good correspondance with the radio continuum, but with some marked differencies. Very prominent in the spectrum of the lobes are the 3.3 and 3.4 micron emission features. These are the first observations of the 3.4 micron feature. Results of the 11.3 micron feature show that the feature carrier is widely present in this object. No evidence of the 9.7 micron silicate absorption is found. For the point source, the 8-13 micron spectrum can be easily explained by means of other observed physical processes. R.J.F.

**N83-18597#** Consiglio Nazionale delle Ricerche, Florence (Italy).
**ON THE NATURE OF THE EXCITING SOURCE IN G333.6-0.2** c90
M. Landini, A. Natta, E. Oliva, P. Salinari, and A. F. M. Moorwood (European Southern Obs., Munich) *In* ESA Galactic and Extragalactic Infrared Spectroscopy Oct. 1982 p 21-22 refs (For primary document see N83-18593 08-80)
Avail: NTIS HC A06/MF A01

The measurement of hydrogen recombination lines between approximately 1.7 and 4.6 microns in G333.6 to 0.2 provides an accurate measure of the near infrared extinction and allows

determination of the stellar contribution to be observed continuum. The near infrared stellar continuum is compatible with the observed bolometric luminosity and the ionization structure of the nebula only if the exciting source is a massive premansequence star (approximately 150 solar masses) or a small system of 0 type supergiants. R.J.F.

**N83-18598#** Observatoire de Paris-Meudon (France). Lab. d'Astrophysique DAPHE.
**FROM INFRARED LINE FLUXES TO PHYSICAL PROPERTIES OF H2 REGIONS** **c90**
G. Stasinska and J. P. Baluteau *In* ESA Galactic and Extragalactic Infrared Spectroscopy Oct. 1982 p 23-25 refs (For primary document see N83-18593 08-88)
Avail: NTIS HC A06/MF A01

The sources of uncertainty in the process of deriving physical characteristics of HII regions from infrared line data are discussed. Emphasis is put on the reliability of atomic data and model nebulae on which bears the interpretation of observed fluxes. R.J.F.

**N83-18599#** University Coll., London (England). Dept. of Physics and Astronomy.
**A MODEL OF HOT OH MASERS COOLED BY INFRARED LINE EMISSION AND THE FORMATION OF CH+** **c90**
T. W. Hartquist and A. Dalgarno (Harvard-Smithsonian Center for Astrophys.) *In* ESA Galactic and Extragalactic Infrared Spectroscopy Oct. 1982 p 29-31 refs (For primary document see N83-18593 08-88)
Avail: NTIS HC A06/MF A01

OH can contain a large fraction of the oxygen in hot (T approximately equals 1000 K) gas bathed in a strong ultraviolet radiation field. Interstellar OH masers probably exist in hot gas cooled by the emission of H2 and OH infrared line radiation and heated by the magnetic precursors of shocks preceding expanding HII regions. If ion streaming provides sufficient energy to drive the reaction of S+ with H2, the hottest gas may be in the precursor regions and the masers will be located in gas which has not been accelerated with respect to the upstream flow. If ion streaming provides sufficient energy to drive the reaction of C+ with H2 to form CH+ in diffuse clouds, a number of difficulties with shock models of its production are removed. R.J.F.

**N83-18600#** Manchester Coll. of Science and Technology (England). Dept. of Mathematics.
**THE INFLUENCE OF METAL ION ASSOCIATION REACTIONS ON INTERSTELLAR CHEMISTRY** **c90**
T. J. Millar *In* ESA Galactic and Extragalactic Infrared Spectroscopy Oct. 1982 p 33-35 refs (For primary document see N83-18593 08-88)
Avail: NTIS HC A06/MF A01

The low fractional electron abundances inferred in dense interstellar clouds from HCO+ and DCO+ observations have led to the conclusion that metals must be severely depleted from the gas in these regions. It is shown that metal ions can associate with neutral molecules and that this process implies that metals need not be as depleted as previously thought. As a result, charge-exchange reactions become more effective in forming interstellar molecules. Also discussed are the formation of metal hydrides, the importance of switching reactions and the possibility that metal ions may catalyse the gas-phase reaction of some neutral reactions. R.J.F.

**N83-18601#** Queen Mary Coll., London (England). Dept. of Physics.
**THE IMPORTANCE OF IMPROVED COLLISION CROSS SECTIONS IN DERIVING INTERSTELLAR CLOUD PARAMETERS FROM ROTATIONAL LINE SPECTRA** **c90**
John E. Beckman *In* ESA Galactic and Extragalactic Infrared Spectroscopy Oct. 1982 p 37-40 refs (For primary document see N83-18593 08-88)
Avail: NTIS HC A06/MF A01

It is shown how present uncertainties in the ability to compute collisional cross sections for rotational transitions can lead to order of magnitude errors in the interpretation of the observed antenna temperatures for rotational emission lines from interstellar clouds. The framework within which improved cross sections can be derived is described, and progress is reported in the aim of reducing the theoretical uncertainty by a factor of five. R.J.F.

**N83-18602#** Carnegie Institution of Washington, Pasadena, Calif. Mount Wilson and Las Campanas Obs.
**HE KINEMATICS IN THE PROTOPLANETARY NEBULA CRL 618** **c90**
S. E. Persson, P. J. McGregor, D. K. Duncan, H. Lanning, T. R. Geballe (UK Infrared Telescope), and Carol J. Lonsdale (Calif. Univ., Los Angeles) *In* ESA Galactic and Extragalactic Infrared Spectroscopy Oct. 1982 p 41-44 refs (For primary document see N83-18593 08-88)
Avail: NTIS HC A06/MF A01

Spectra at 25 kms-1 resolution of the V = 1 yields 0 S(1) line of H, and H alpha and (N II) lambda 6583 in the protoplanetary nebula CRL 618 are presented. The H2 line is 100 kms wide, full width at zero intensity, and blueshifted 15 kms-1 from the CO line centroid. By comparing centroid velocities, line widths and extinctions of the various observed lines it is postulated that the excited H2 molecules are located in dense clumps near the inner boundary of the dust toroid and that these clumps are participating in the mass outflow. R.J.F.

**N83-18603#** University Coll., London (England). Dept. of Physics and Astronomy.
**THE STRENGTH OF HD INFRARED EMISSION IN ORION** **c89**
T. W. Hartquist, C. M. Mountain (Imperial Coll. of Sci. and Technol.), M. J. Selby, and E. Roueff *In* ESA Galactic and Extragalactic Infrared Spectroscopy Oct. 1982 p 45-46 refs (For primary document see N83-18593 08-88)
Avail: NTIS HC A06/MF A01

If rotational vibrational levels of HD are excited primarily by collisions, the HD line emission from vibrationally excited levels is approximately 10-4 - 10-3 as strong as the observed H2 line radiation. The ratio is more likely to be 10-3 - 10-2 when comparing emission from levels in the ground vibrational states. However, ultraviolet pumping of HD is probably very important and the HD infrared emissivity is roughly 10-2 - 10-1 that of H2. With the lines from the R and P branches of the rotational-vibrational bands falling in the 2 microns and 3 atmospheric windows, the observation of HD emission is well within the range of present ground based instruments. R.J.F.

**N83-18604#** European Southern Observatory, Munich (West Germany).
**CVF SPECTROSCOPY OF THE 23 MICRON CO BAND IN ACTIVE GALAXIES** **c89**
A. F. M. Moorwood *In* ESA Galactic and Extragalactic Infrared Spectroscopy Oct. 1982 p 47-49 refs (For primary document see N83-18593 08-88)
Avail: NTIS HC A06/MF A01

Multiaperture, 2-2.5 microns, CVF spectra of several active galaxies have been obtained with the primary aim of determining the normal galaxy (stellar) contribution around 2 microns by fitting the 2.3 microns CO absorption band. using J, H, K, L photometry obtained in the same diaphragms, this can be compared with values derived from near infrared two color diagrams under various assumptions concerning the nature of the nuclear source. Results for the weak Seyfert 1 galaxy NGC 7213 are discussed in some detail and preliminary comments are made on some other galaxies for which the data analysis is not yet complete. Author

**N83-18605#** Carnegie Institution of Washington, Pasadena, Calif.
**4.6 MICRON ABSORPTION FEATURES DUE TO SOLID PHASE CO TOWARD COMPACT INFRARED SOURCES** **c90**
P. J. McGregor, S. E. Persson, J. H. Lacy (Caltech), F. Baas (Leiden Univ.), L. Allamandola (Leiden Univ.), Carol J. Lonsdale (Calif. Univ., Los Angeles), and T. R. Greballe (UK Infrared Telescope) *In* ESA Galactic and Extragalactic Infrared Spectros-

copy Oct. 1982 p 51-55 refs (For primary document see N83-18593 08-88)
Avail: NTIS HC A06/MF A01

Spectra in the region of the CO 4.6 microns fundamental band of seven compact infrared sources in molecular clouds are presented. The resolving power of 830 is sufficient to show that in W33A and NGC 7538/IRS 9 three distinct features contribute to a strong absorption near 4.6 microns. Comparison of the astronomical data with laboratory CO absorption spectra establishes that the two strongest features are due to cold, solid CO. The three features vary in strength with respect to each other amongst the observed sources, behavior that can also be reproduced in the laboratory by a combination of temperature cycling and UV irradiation of the sample. The implications for the condensation of CO, and the masses of giant molecular clouds according to the ideas of Leger (1982) are briefly discussed. B.W.

**N83-18606#** Preston Polytechnic (England). Div. of Physics and Astronomy.
**THREE MICRON SPECTROSCOPY OF DUST c90**
D. C. B. Whittet, J. K. Davies, M. F. Bode (Keele Univ., Engl.), A. Evans (UK Infrared Telescope Unit, Hawaii), and A. J. Longmore *In* ESA Galactic and Extragalactic Infrared Spectroscopy Oct. 1982 p 59-64 refs Sponsored by SRC (For primary document see N83-18593 08-88)
Avail: NTIS HC A06/MF A01

This contribution discusses recent observations of dust related spectral features in the 3-4 microns atmospheric window. A survey of 40 Herbig Be/Ae spectra reveals three cases of unidentified emission features in the 3.3-3.5 microns region analogous to those observed in nebulae. The 3.06 microns absorption attributed to water-ice is found to occur at much lower threshold optical depth in the Taurus molecular cloud than in Ophiuchus. Model fitting supports the ice identification, and suggests that the long wavelength wing may be a blended feature resembling the 3.2-3.6 microns absorption in the galactic center. Author

**N83-18607#** Max-Planck-Institut fuer Astronomie, Heidelberg (West Germany).
**FROM 1.2 MICRONS TO 13 MICRONS: OBSERVATIONS OF CEP-A c89**
R. Lenzen and H. Hefele (Astron. Recheninst.) *In* ESA Galactic and Extragalactic Infrared Spectroscopy Oct. 1982 p 65-68 refs (For primary document see N83-18593 08-88)
Avail: NTIS HC A06/MF A01

A 3.5x2.0 aromin(2) region in Cep 083 encompassing the two 21 cm continuum radio maxima has been mapped at 2.2 microns. An extended source at the position of the far infrared source has been found, elongated in east-west direction, the direction defined by the anisotropic mass outflow, recently detected by Ho et al. The photometric and spectrophotometric observations from 1.6 to 13 microns are reported. Strong absorption features of water ice at 3.09 microns and of silicate at 9.7 microns show the source to be highly obscured by cold dust emitting in the far infrared region. The overall spectral flux distribution for this source is characterized by a pronounced double peak similar to the case of the protostellar object NGC7538/IRS9. Author

**N83-18608#** Consiglio Nazionale delle Ricerche, Frascati (Italy). Inst. Astrofis. Spaziale.
**GL2088: A PECULIAR GALACTIC INFRARED SOURCE c90**
P. Persi and M. Ferrari-Toniolo *In* ESA Galactic and Extragalactic Infrared Spectroscopy Oct. 1982 p 69-72 refs Sponsored by NATO (For primary document see N83-18593 08-88)
Avail: NTIS HC A06/MF A01

The 1.4% resolution 2.8-4.2 microns spectrum of the low excitation nebula GL 2088, shows an emission feature at approximately 3.3 microns and a broad absorption feature near 3.9 microns. The continuum infrared energy distribution from to 20 microns, is well fitted by a blackbody at T sub c = 520 K. These results suggest a rough model for GL 2088 in which warm emitting dust grains, located in a disk like circumstellar envelope and formed in a carbon rich environment, are responsible for the IR emission. GL 2088 could represent a different evolutionary stage of protoplanetary nebulae, up to now unknown. Author

**N83-18609#** European Space Research and Technology Center, Noordwijk (Netherlands). ESA Space Science Dept.
**HIGH RESOLUTION INFRARED SPECTROSCOPY OF W51-IRS2 c89**
J. P. Phillips, G. J. White (Queen Mary Coll.), K. J. Richardson (Queen Mary Coll.), and P. M. Williams (UK Infrared Telescope, Hawaii) *In* ESA Galactic and Extragalactic Infrared Spectroscopy Oct. 1982 p 73-75 refs Sponsored by PATT and SRC (For primary document see N83-18593 08-88)
Avail: NTIS HC A06/MF A01

Spectra were obtained of W51-IRS2 in the wavelength ranges 2.95-3.5 microns, and 3.99-4.1 microns. These show the presence of the Pf epsilon and Br alpha recombination lines of HI, and the 3.28 microns narrow band emission feature. Sampling of Br alpha and the 3.28 microns feature northwards of IRS-2 shows emission to be in both cases extended over radial distances > 20 arc seconds. In the case of Br alpha, we interpret this to arise in a blister region of density > or approximately 10 to the 3rd power/cu cm. For the 3.28 microns feature, we demonstrate that observed band strengths are consistent with the Dweck et al. (1980) hypothesis of thermal excitation, providing that the oscillators responsible for this emissions are located within one extinction optical depth of the HI/HII interface. B.W.

**N83-18610#** Stockholm Observatory (Sweden).
**FAR INFRARED OBSERVATIONS OF THE DIFFUSE COMPONENT OF THE GALACTIC DUST EMISSION c90**
H. L. Nordh, G. Olofsson, and J. R. Houck (Cornell Univ., Ithaca, New York) *In* ESA Galactic and Extragalactic Infrared Spectroscopy Oct. 1982 p 77-78 refs (For primary document see N83-18593 08-88)
Avail: NTIS HC A06/MF A01

With the purpose of measuring the intensity of the diffuse galactic dust emission a liquid helium cooled telescope has been launched from Esrange (Sweden) onboard a sounding rocket. In this preliminary report signals obtained at 90 and 120 microns from a region centered at approximately 137 deg and approximately 13 deg are analyzed by using the interstellar dust model developed by Mezger, Mathis and Panagia. The derived temperature of the bare graphite particles is < or = 24 K and that of the bare silicate grains is < or = 15 K. These rather low temperatures indicate that the contribution to the observed radiation from extended low density HII regions must be very small. Author

**N83-18611#** Consiglio Nazionale delle Ricerche, Florence (Italy). Centro per l'Astronomia IR e lo Studio del Mezzo Instellare.
**EXTINCTION BY DUST IN DENSE INHOMOGENEOUS CLOUDS c90**
A. Natta and N. Panagia *In* ESA Galactic and Extragalactic Infrared Spectroscopy Oct. 1982 p 79-81 refs (For primary document see N83-18593 08-88)
Avail: NTIS HC A06/MF A01

Model calculations of the attenuation produced by a thick, inhomogeneous dust layer in front of an extended source have shown that the apparent optical depth is always lower than the true average value. This results in an apparent extinction curve flatter than the grains intrinsic one. An analysis of the heavily obscured compact HII region K 3-50 reveals that both interstellar and local dust contribute to estinguish its radiation. The local component is distributed in a very inhomogeneous way across the region and can have an extinction cross section very similar to that of interstellar dust. Author

**N83-18612#** Imperial Coll. of Science and Technology, London (England). Dept. of Physics.
**EXTINCTION CORRECTIONS IN GROUND BASED INFRARED SPECTROMETRY c89**
C. M. Mountain, M. J. Selby, and C. Sanchez-Hagro (Inst. Astrofis. de Canarias, Tenerife, Spain) *In* ESA Galactic and Extragalactic

Infrared Spectroscopy Oct. 1982 p 85-88 refs (For primary document see N83-18593 08-88)
Avail: NTIS HC A06/MF A01

Calculations of atmospheric transmission through the M (5 microns) atmospheric window, at a resolution of 10 to the 3rd power are presented for sites at the Observatorio del Teide, Tenerife and the NHO, La Plama in the Canary Islands. We use a standard midlatitude atmospheric model and absorption line strengths for the known molecular species calculated at a height of 2.38 kms. It is demonstrated how the normal procedure for calibration of extinction can give systematic errors in the assessment of infrared flux both for photometry, using broad band filters, and for spectrometry. Author

**N83-18613#** Goettingen Univ. (West Germany).
**INFRARED, OPTICAL AND UV SPECTROSCOPY OF LOW REDSHIFT QSO'S** **c89**
W. Kollatschny and K. J. Fricke *In* ESA Galactic and Extragalactic Infrared Spectroscopy Oct. 1982 p 89-92 refs (For primary document see N83-18593 08-88)
Avail: NTIS HC A06/MF A01

Ultraviolet, optical, and infrared spectroscopy of three Parkes quasars is presented. From a discussion of the Lyman, Balmer, and Paschen line ratios the role of classical recombination theory and dust reddening for the interpretation of quasar spectra is assessed. Author

**N83-18614#** McDonald Observatory, Fort Davis, Tex. Millimeter Wave Obs.
**THE RELATIONSHIP BETWEEN THE COLD AND DENSE REGIONS IN RHO OPH: THE DCOT LINES** **c89**
Robert B. Loren and A. Wootten (Rensselaer Polytech.) *In* ESA Galactic and Extragalactic Infrared Spectroscopy Oct. 1982 p 93-99 refs (For primary document see N83-18593 08-88)
(Grant NSF AST-81-16403)
Avail: NTIS HC A06/MF A01

The four lowest DCO(+) transitions have been observed in a region of the Rho Oph cloud. The unusually strong DCO(+) emission requires the presence of a very dense and cold molecular cloud core. Adjacent to this DCO(+) emission core is a region of rare 2 cm H2CO emission which is interpreted as a shocked layer propagating into the DCO(+) region. This shock arises from the interaction of an old supernova remnant and the molecular cloud. Author

**N83-18615#** Centre National d'Etudes Spatiales, Toulouse (France).
**FRENCH SPACE PROGRAMS [PROGRAMME SPATIAL FRANCAIS]**
1982 220 p refs In FRENCH; ENGLISH summary Presented at 24th COSPAR Plenary Meeting, Ottawa 17 May - 2 Jun. 1982 Prepared in cooperation with Comite National Francais de Recherche dans l'Espace
Avail: NTIS HC A10/MF A01

Various activities of French space programs are discussed. Astronomy, solar physics, Earth resources, geodesy, Earth atmosphere, and the solar system are among the topics discussed. R.J.F.

**N83-18616#** Comision Nacional de Investigacion del Espacio, Madrid. Committee on Space Research.
**PROCEEDINGS OF THE 24TH COSPAR PLENARY MEETING ON SPACE RESEARCH**
1982 60 p refs Meeting held in Ottawa, 17 May - 2 Jun. 1982 Original contains color illustrations
Avail: NTIS HC A04/MF A01

Various topics involving space research are discussed. Meteorological sounding rocket activities are discussed. Atmospheric ozone experiments are described. Airglow infrared and visible photometry data collected with a rocket-borne photometer is discussed. A search for pulsed radio emission from compact sources in supernova remnants is described. R.J.F.

# 89 ASTRONOMY

Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

**N83-18617*#** California Univ., Berkeley. Space Sciences Lab.
**THE NAUTRE OF DWARF NOVAE AND RELATED SYSTEMS Final Technical Report**
Michael Lampton 27 Jan. 1983 7 p
(Grant NAGw-44)
(NASA-CR-169780; NAS 1.26:169780) Avail: NTIS HC A02/MF A01 CSCL 03A

The high energy emissions from cataclysmic variables (interacting binary systems containing an accreting white dwarf) and the relationship of the high energy emission of these stars to their optical properties were investigated. The relationship of the cataclysmic binaries to the strong X-ray emitting binaries that contain a neutron star as the accreting star was examined. A soft X-ray survey of cataclysmic variable stars was carried out. Approximately 75% of all the sources observed were detected in short (2000 sec) observations. Relationships between the X-ray and optical luminosity and the dependence of this quantity on the subclass of the variable were investigated and constraints on the nature of these systems were provided. S.L.

**N83-18618#** Royal Observatory, Edinburgh (Scotland).
**THE UK 1.2M SCHMIDT TELESCOPE AND THE SOUTHERN SKY SURVEY. PART 5: AN ABSOLUTE CALIBRATION OF THE NIGHT SKY PHOTOMETER OR THE UK 1.2M SCHMIDT TELESCOPE**
R. J. Smyth 1982 28 p refs
(ROE-OR-8; ISSN-0309-099-X) Avail: NTIS HC A03/MF A01

A comparison of parallel UBV observations obtained using the Night Sky Photometer (NSP) of the UK 1.2-m Schmidt Telescope and a photometric telescope at the same site led to recalibrations of the U-, B- and V-band surface brightness measurements of the NSP. The night sky brightness is found to be, on average, 0m15/sq arcsec brighter in both the B and V bands and 0m11/sq arsec fainter in the U band, in the new system than in the old. Absolute calibration to an accuracy of +1 0m1/sq arcsec is feasible for plates taken at field centers north of delta equiv. -65 deg, subject to the exclusion of bright field stars. A fault was discovered in the NSP electronics at the time of these tests which would appear to invalidate the calibration for delta < -70 deg. Author

**N83-18619#** Helsinki Univ. of Technology, Espoo (Finland). Radio Lab.
**OBSERVING METHODS FOR THE MILLIMETER WAVE RADIO TELESCOPE AT THE METSAEHOVI RADIO RESEARCH STATION AND OBSERVATIONS OF THE SUN AND EXTRAGALACTIC SOURCES Ph.D. Thesis**
Seppo Urpo Mar. 1982 14 p refs
(Rept-S-132; ISBN-951-752-696-2) Avail: NTIS HC A02/MF A01

The Radio Laboratory of the Helsinki University of Technology started intensive radio astronomical research in 1974 when a new 14 meter radio telescope for millimeter wave region was completed. The telescope is situated at the Metshovi Radio Research Station about 40 km west of Helsinki. The telescope is covered by a self supporting metal space frame radome. This was a new technique in short millimeter wave radio astronomy and the possible effects of the radome in observations were unknown. The main purpose of the research was to develop the observing methods used at the Metsahovi Radio Research Station to a level where significant scientific results are possible in the fields of radio science and astrophysics. B.W.

**N83-18620#** Los Alamos Scientific Lab., N. Mex.
**THE MASSES AND PULSATIONS OF BL HERCULIS VARIABLES**
S. W. Hodson, A. N. Cox, and D. S. King 1981 6 p refs Presented at the IAU Colloq. 68, Schenectady, N.Y., 7-10 Oct. 1981 Submitted for publication
(Contract W-7405-eng-36)

(DE82-002347; LA-UR-81-3250; CONF-8110131-2) Avail: NTIS HC A02/MF A01

From linear results, the masses of BL Her variables must be nearer to 0.55 M/sub sun/ than 0.75 M/sub sun/ if the bump phase transition (resonance) is to be located anywhere near the observed period range of 1./sup d/5 to 1./sup d/7. The nonlinear results are consistent with the Si non resonance concept, but demonstrate that light and velocity curve shapes are a nonlinear phenomenon that require nonlinear period ratios to display the resonances only in the narrow, observed range of 1./sup d/5 to 1./sup d/7. The mass near 0.55 M/sub sun/ is in good agreement with evolution calculation. DOE

**N83-18621#** Los Alamos Scientific Lab., N. Mex.
**RR LYRAE VARIABLE PULSATIONS AND THE OOSTERHOFF GROUPS**
Arthur N. Cox, Stephen W. Hodson, and Sean P. Clancy 1981 9 p refs Presented at the IAU Colloq. 68, Schenectady, N.Y., 7-10 Oct. 1981
(Contract W-7405-eng-36)
(DE82-002346; LA-UR-81-3251; CONF-8110131-1) Avail: NTIS HC A02/MF A01

The RR Lyrae variables were studied in the context of the two Oosterhoff groups of globular clusters. While they are not completely distinct, these groups are distinguished by their different mean RR Lyrae variable periods. Group 1 is relatively metal rich and group 2 is more metal poor. Even metal richer field RR Lyrae variables which are presumably even younger and less massive than the stars in the group 1 clusters, we call group 0. It is found that Oosterhoff group 1 clusters have 0.55 M/sub sun/ stars and group 2 clusters have 0.65 M/sub sun/ stars. The Y value is always about 0.29. Mean log L/L/sub sun/ values are 1.66 and 1.78 giving M/sub bol/ = 0.60 and 0.30 for the RR Lyrae variables in these two groups of clusters. For field RR Lyrae variables at M = approximately 0.5 M/sub sun/ or less, perhaps M/sub bol/ = 0.90 or even larger. It is concluded that all evolution is blueward for RR Lyrae variables, and the color overlap of F and IH pulsators is not real. DOE

**N83-18594#** Arizona Univ., Phoenix. Steward Observatory.
**LINE EXCESS OBJECTS: A NEW INFRARED SPECTROSCOPIC CLASS**
Roger I. Thompson *In* ESA Galactic and Extragalactic Infrared Spectroscopy Oct. 1982 p 7-10 refs (For primary document see N83-18593 08-88)
Avail: NTIS HC A06/MF A01

**N83-18596#** Max-Planck-Institut fuer Astronomie, Heidelberg (West Germany).
**CVF SPECTRALPHOTOMETRY OF THE H2 REGION S 106**
C. Eiroa and H. Hefele (Astronomisches Recheninst.) *In* ESA Galactic and Extragalactic Infrared Spectroscopy Oct. 1982 p 17-20 refs (For primary document see N83-18593 08-88)
Avail: NTIS HC A06/MF A01

**N83-18603#** University Coll., London (England). Dept. of Physics and Astronomy.
**THE STRENGTH OF HD INFRARED EMISSION IN ORION**
T. W. Hartquist, C. M. Mountain (Imperial Coll. of Sci. and Technol.), M. J. Selby, and E. Roueff *In* ESA Galactic and Extragalactic Infrared Spectroscopy Oct. 1982 p 45-46 refs (For primary document see N83-18593 08-88)
Avail: NTIS HC A06/MF A01

**N83-18604#** European Southern Observatory, Munich (West Germany).
**CVF SPECTROSCOPY OF THE 23 MICRON CO BAND IN ACTIVE GALAXIES**
A. F. M. Moorwood *In* ESA Galactic and Extragalactic Infrared Spectroscopy Oct. 1982 p 47-49 refs (For primary document see N83-18593 08-88)
Avail: NTIS HC A06/MF A01

**N83-18607#** Max-Planck-Institut fuer Astronomie, Heidelberg (West Germany).
**FROM 1.2 MICRONS TO 13 MICRONS: OBSERVATIONS OF CEP-A**
R. Lenzen and H. Hefele (Astron. Recheninst.) *In* ESA Galactic and Extragalactic Infrared Spectroscopy Oct. 1982 p 65-68 refs (For primary document see N83-18593 08-88)
Avail: NTIS HC A06/MF A01

**N83-18609#** European Space Research and Technology Center, Noordwijk (Netherlands). ESA Space Science Dept.
**HIGH RESOLUTION INFRARED SPECTROSCOPY OF W51-IRS2**
J. P. Phillips, G. J. White (Queen Mary Coll.), K. J. Richardson (Queen Mary Coll.), and P. M. Williams (UK Infrared Telescope, Hawaii) *In* ESA Galactic and Extragalactic Infrared Spectroscopy Oct. 1982 p 73-75 refs Sponsored by PATT and SRC (For primary document see N83-18593 08-88)
Avail: NTIS HC A06/MF A01

**N83-18612#** Imperial Coll. of Science and Technology, London (England). Dept. of Physics.
**EXTINCTION CORRECTIONS IN GROUND BASED INFRARED SPECTROMETRY**
C. M. Mountain, M. J. Selby, and C. Sanchez-Hagro (Inst. Astrofis. de Canarias, Tenerife, Spain) *In* ESA Galactic and Extragalactic Infrared Spectroscopy Oct. 1982 p 85-88 refs (For primary document see N83-18593 08-88)
Avail: NTIS HC A06/MF A01

**N83-18613#** Goettingen Univ. (West Germany).
**INFRARED, OPTICAL AND UV SPECTROSCOPY OF LOW REDSHIFT QSO'S**
W. Kollatschny and K. J. Fricke *In* ESA Galactic and Extragalactic Infrared Spectroscopy Oct. 1982 p 89-92 refs (For primary document see N83-18593 08-88)
Avail: NTIS HC A06/MF A01

**N83-18614#** McDonald Observatory, Fort Davis, Tex. Millimeter Wave Obs.
**THE RELATIONSHIP BETWEEN THE COLD AND DENSE REGIONS IN RHO OPH: THE DCOT LINES**
Robert B. Loren and A. Wootten (Renssealer Polytech.) *In* ESA Galactic and Extragalactic Infrared Spectroscopy Oct. 1982 p 93-99 refs (For primary document see N83-18593 08-88)
(Grant NSF AST-81-16403)
Avail: NTIS HC A06/MF A01

# 90 ASTROPHYSICS

Includes cosmology; and interstellar and interplanetary gases and dust.

**N83-18622*#** California Univ., Berkeley. Dept. of Physics.
**DETECTION OF INTERSTELLAR NH SUB 3 IN THE FAR-WARM AND DENSE GAS IN ORION-KL**
C. H. Townes, R. Gentzel, Dan M. Watson (California Inst. of Tech., Pasadena), and J. W. V. Storey (New South Wales Univ., Kensington) [1982] 14 p refs Sponsored in part by Anglo-Australian Observatory, Epping, Australia)
(Grant NGR05-003-511)
Avail: NTIS HC A02/MF A01

The detection of the (J,K) = a(4,3) yields s(3,3) rotation inversion transition of ammonia at 124.6 microns toward the center of the Orion-KL region is reported. The line is in emission and has a FWHM > or = to 30 km s 0.15. The far IR ammonia line emission probably comes mainly from the 'hot core', a compact region of warm, very dense gas previously identified by the radio inversion lines of NH3. The a(4,3) yields s(3,3) line is very optically thick, and since it is seen in emission, radiative excitation of the (4,3) NH3 level by far IR emission from dust within the source can be ruled out. Radiative excitation via the 10 microns of

vibrational transitions of NH3 also seems unlikely. Hence, the (4,3) level is probably collisionally excited and the gas in the hot core region is warmer than the dust. Since the far IR line emission is highly trapped, densities of approximately 10 to the 7th power cu cm are high enough to explain the observations. Shock heating by the mass outflow from IRc2 may account for the high gas temperatures in the hot core region. S.L.

**N83-18623#** University Coll., Cardiff (Wales). Dept. of Applied Mathematics and Astronomy.
**ORGANO-SILICEOUS BIOMOLECULES AND THE INFRARED SPECTRUM OF THE TRAPEZIUM NEBULA AND INTERSTELLAR ABSORPTIONS AT 3.2 MICRONS AND 3.3 MICRONS**
F. Hoyle, N. C. Wickramasinghe, and S. Al-Mufti Feb. 1982 27 p refs Submitted for publication
(Preprint-75) Avail: NTIS HC A03/MF A01

Organo-siliceous biomolecules and the infrared spectrum of the trapezium nebula and interstellar absorptions at 3.2 microns and 3.3 microns are discussed. For individual titles, see N83-18624 through N83-18625.

**N83-18624#** University Coll., Cardiff (Wales). Dept. of Applied Mathematics and Astronomy.
**ORGANO-SILICEOUS BIOMOLECULES AND THE INFRARED SPECTRUM OF THE TRAPEZIUM NEBULA**
F. Hoyle, N. C. Wickramasinghe, and S. Al-Mufti *In its* Organo-Siliceous Biomolecules and the Infrared Spectrum of the Trapezium Nebular and Interstellar Absorptions at 3.2 Microns and 3.3 microns Feb. 1982 18 p refs (For primary document see N83-18623 08-90)
Avail: NTIS HC A03/MF A01

A close correspondence exists between the infrared properties of a mixed culture of diatoms and the infrared spectrum of dust in the Trapezium nebula. It is argued that this correspondence points to a cosmic microbiological system in which organo-siliceous polymers are an abundant constituent. The high content of Si relative to Mg found in the Earth's crust and in Lunar and Martian surface material is readily explained on the basis of accretion of silicon-rich microbiology. Author

**N83-18625#** University Coll., Cardiff (Wales). Dept. of Applied Mathematics and Astronomy.
**INTERSTELLAR ABSORPTIONS AT 3.2 MICRONS AND 3.3 MICRONS**
S. Al-Mufti, F. Hoyle, and N. C. Wickramasinghe *In its* Organo-Siliceous Biomolecules and the Infrared Spectrum of the Trapezium Nebula and Interstellar Absorptions at 3.2 Microns and 3.3 Microns Feb. 1982 8 p refs (For primary document see N83-18623 08-90)
Avail: NTIS HC A03/MF A01

In a recent attempt to interpret the IR spectrum of the source GC-IRS 7 on the basis of a bacterial strain model (Hoyle et al., 1982), two absorption features at 3.2 and 3.3 microns remained unexplained. It is suggested that NH3(+) vibrations due to free amino acids in bacterial grains may provide a self-consistent explanation of the unidentified absorptions in the IR. Author

**N83-18595#** Osservatorio Astrofisico di Arcetri, Florence (Italy).
**INFRARED SPECTROSCOPY OF P-CYGNI'S STELLAR WIND**
M. Felli, E. Oliva, A. Natta (CNR, Florence), R. Stanga (Florence Univ.), and S. Beckwith (Cornell Univ., Ithaca, New York) *In* ESA Galactic and Extragalactic Infrared Spectroscopy Oct. 1982 p 13-15 refs (For primary document see N83-18593 08-88)
Avail: NTIS HC A06/MF A01

**N83-18597#** Consiglio Nazionale delle Ricerche, Florence (Italy).
**ON THE NATURE OF THE EXCITING SOURCE IN G333.6-0.2**
M. Landini, A. Natta, E. Oliva, P. Salinari, and A. F. M. Moorwood (European Southern Obs., Munich) *In* ESA Galactic and Extragalactic Infrared Spectroscopy Oct. 1982 p 21-22 refs (For primary document see N83-18593 08-80)
Avail: NTIS HC A06/MF A01

**N83-18598#** Observatoire de Paris-Meudon (France). Lab. d'Astrophysique DAPHE.
**FROM INFRARED LINE FLUXES TO PHYSICAL PROPERTIES OF H2 REGIONS**
G. Stasinska and J. P. Baluteau *In* ESA Galactic and Extragalactic Infrared Spectroscopy Oct. 1982 p 23-25 refs (For primary document see N83-18593 08-88)
Avail: NTIS HC A06/MF A01

**N83-18599#** University Coll., London (England). Dept. of Physics and Astronomy.
**A MODEL OF HOT OH MASTERS COOLED BY INFRARED LINE EMISSION AND THE FORMATION OF CH+**
T. W. Hartquist and A. Dalgarno (Harvard-Smithsonian Center for Astrophys.) *In* ESA Galactic and Extragalactic Infrared Spectroscopy Oct. 1982 p 29-31 refs (For primary document see N83-18593 08-88)
Avail: NTIS HC A06/MF A01

**N83-18600#** Manchester Coll. of Science and Technology (England). Dept. of Mathematics.
**THE INFLUENCE OF METAL ION ASSOCIATION REACTIONS ON INTERSTELLAR CHEMISTRY**
T. J. Millar *In* ESA Galactic and Extragalactic Infrared Spectroscopy Oct. 1982 p 33-35 refs (For primary document see N83-18593 08-88)
Avail: NTIS HC A06/MF A01

**N83-18601#** Queen Mary Coll., London (England). Dept. of Physics.
**THE IMPORTANCE OF IMPROVED COLLISION CROSS SECTIONS IN DERIVING INTERSTELLAR CLOUD PARAMETERS FROM ROTATIONAL LINE SPECTRA**
John E. Beckman *In* ESA Galactic and Extragalactic Infrared Spectroscopy Oct. 1982 p 37-40 refs (For primary document see N83-18593 08-88)
Avail: NTIS HC A06/MF A01

**N83-18602#** Carnegie Institution of Washington, Pasadena, Calif. Mount Wilson and Las Campanas Obs.
**HE KINEMATICS IN THE PROTOPLANETARY NEBULA CRL 618**
S. E. Persson, P. J. McGregor, D. K. Duncan, H. Lanning, T. R. Geballe (UK Infrared Telescope), and Carol J. Lonsdale (Calif. Univ., Los Angeles) *In* ESA Galactic and Extragalactic Infrared Spectroscopy Oct. 1982 p 41-44 refs (For primary document see N83-18593 08-88)
Avail: NTIS HC A06/MF A01

**N83-18605#** Carnegie Institution of Washington, Pasadena, Calif.
**4.6 MICRON ABSORPTION FEATURES DUE TO SOLID PHASE CO TOWARD COMPACT INFRARED SOURCES**
P. J. McGregor, S. E. Persson, J. H. Lacy (Caltech), F. Baas (Leiden Univ.), L. Allamandola (Leiden Univ.), Carol J. Lonsdale (Calif. Univ., Los Angeles), and T. R. Greballe (UK Infrared Telescope) *In* ESA Galactic and Extragalactic Infrared Spectroscopy Oct. 1982 p 51-55 refs (For primary document see N83-18593 08-88)
Avail: NTIS HC A06/MF A01

**N83-18606#** Preston Polytechnic (England). Div. of Physics and Astronomy.
**THREE MICRON SPECTROSCOPY OF DUST**
D. C. B. Whittet, J. K. Davies, M. F. Bode (Keele Univ., Engl.), A. Evans (UK Infrared Telescope Unit, Hawaii), and A. J. Longmore *In* ESA Galactic and Extragalactic Infrared Spectroscopy Oct. 1982 p 59-64 refs Sponsored by SRC (For primary document see N83-18593 08-88)
Avail: NTIS HC A06/MF A01

**N83-18608#** Consiglio Nazionale delle Ricerche, Frascati (Italy). Inst. Astrofis. Spaziale.
**GL2088: A PECULIAR GALACTIC INFRARED SOURCE**
P. Persi and M. Ferrari-Toniolo *In* ESA Galactic and Extragalactic Infrared Spectroscopy Oct. 1982 p 69-72 refs Sponsored by

NATO (For primary document see N83-18593 08-88)
Avail: NTIS HC A06/MF A01

**N83-18610#** Stockholm Observatory (Sweden).
**FAR INFRARED OBSERVATIONS OF THE DIFFUSE COMPONENT OF THE GALACTIC DUST EMISSION**
H. L. Nordh, G. Olofsson, and J. R. Houck (Cornell Univ., Ithaca, New York) *In* ESA Galactic and Extragalactic Infrared Spectroscopy Oct. 1982 p 77-78 refs (For primary document see N83-18593 08-88)
Avail: NTIS HC A06/MF A01

**N83-18611#** Consiglio Nazionale delle Ricerche, Florence (Italy). Centro per l'Astronomia IR e lo Studio del Mezzo Instellare.
**EXTINCTION BY DUST IN DENSE INHOMOGENEOUS CLOUDS**
A. Natta and N. Panagia *In* ESA Galactic and Extragalactic Infrared Spectroscopy Oct. 1982 p 79-81 refs (For primary document see N83-18593 08-88)
Avail: NTIS HC A06/MF A01

# 91 LUNAR AND PLANETARY EXPLORATION

Includes planetology; and manned and unmanned flights. For spacecraft design see *18 Spacecraft Design Testing, and Performance*. For space stations see *15 Launch Vehicles and Space Vehicles*.

**N83-18626** Institut d'Aeronomie Spatiale de Belgique, Brussels.
**THE OBLATENESS EFFECT ON THE SOLAR RADIATION INCIDENT AT THE TOP OF THE ATMOSPHERE OF MARS**
E. vanHemelrijck 1982 23 p refs In ENGLISH; FRENCH, GERMAN and DUTCH summaries Presented at European Geophys. Soc. Symp. on the Planet Mars, Leeds, England, 27 Aug. 1982
(Aeronomica-Acta-A-248-1982) Avail: Issuing Activity

Calculations of the daily solar radiation indicent at the top of the atmosphere of Mars (the outer planet with the smallest flattening known), with and without the effect of the oblateness, are presented in a figure illustrating the seasonal and latitudinal variation of the ratio of both insolations. It is shown that for parts of the summer, the daily insolation of Mars, assumed as an oblate planet, is slightly increased. In winter, the flattening effect results in a somewhat more extensive polar region, the solar energy input being always reduced when compared to a spherical planet. In addition, the mean daily solar radiation was numerically studied. It is found that the mean summer daily insolation is scarcely increased between the equator and the subsolar point, but decreased poleward of the above mentioned limit. In winter, however, the mean daily insolation is always reduced, the maximum loss of insolation attaining approximately 2% in the 60 to 80 deg latitude interval. The partial gain of the mean summertime insolation being considerably smaller than the reduction during winter season evidently yields a mean annual daily insolation which is decreased, maximally by about 0.5% near mid-latitudes, at all latitudes. M.G.

**N83-18627*#** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
**THE MAGNETOSPHERE OF SATURN**
A. W. Schardt Dec. 1982 96 p refs
(NASA-TM-84947; NAS 1.15:84947) Avail: NTIS HC A05/MF A01 CSCL 03B

Information about the magnetosphere of Saturn is provided: the magnetic dipole moment is axisymmetric, the bow shock stand-off distance is about 22 R sub S. The satellites Titan, Dione, and Tethys are probably the primary sources of magnetospheric plasma. Outside of approx. 4 R sub S, energetic particles are energized by diffusing inward while conserving their first and second adiabatic invariants. Particles are lost by satellite sweep-out, absorption byt the E ring and probably also by plasma interactions. The inner magnetosphere is characterized. Author

**N83-18628*#** Arizona Univ., Tucson. Lunar and Planetary Lab.
**STUDIES OF PLANETARY EXTENDED ATMOSPHERES Final Report**
Robert A. Brown (Space Telescope Science Inst., Baltimore) 15 Feb. 1983 12 p refs
(Grant NsG-7634)
(NASA-CR-169860; NAS 1.26:169860) Avail: NTIS HC A02/MF A01 CSCL 03B

The light produced by the atoms and ions of Jupiter's luminous, heavy particle environment was studied. High resolution spectrophotometry is discussed. Author

**N83-18629*#** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
**THE SOURCE OF SATURN ELECTROSTATIC DISCHARGES: ATMOSPHERIC STORMS**
M. L. Kaiser, J. E. P. Connerney, and M. D. Desch Jan. 1983 19 p refs
(NASA-TM-84966; Rept-695; NAS 1.15:84966) Avail: NTIS HC A02/MF A01 CSCL 03B

Important properties of the recently discovered Saturn electrostatic discharges are entirely consistent with an extended lightning storm system in Saturn's atmosphere. The presently favored B-ring location is ruled out. Author

**N83-18630*#** Arizona Univ., Tucson. Lunar and Planetary Lab.
**ABSORPTION OF SUNLIGHT IN THE ATMOSPHERE OF VENUS Final Report, 1 Jan. 1980 -30 Apr. 1982**
M. G. Tomasko and L. R. Doose 20 Dec. 1982 16 p refs
(Grant NAGw-55)
(NASA-CR-169874; NAS 1.26:169874) Avail: NTIS HC A02/MF A01 CSCL 03B

The profiles of upward, downward and net solar flux on Venus were measured at altitudes from about 62 km to the surface in three spectral bands at a vertical resolution of a few hundred meters. These data measured the penetration and absorption of solar energy in Venus' lower atmosphere quantities that are essential in evaluating the role of the greenhouse mechanism in supporting Venus' remarkably high surface temperature. In addition, the data constrained the vertical structure and optical properties of the Venus clouds. S.L.

**N83-18631#** Royal Observatory, Edinburgh (Scotland).
**PROCEEDINGS OF THE WORKSHOP ON INTERSTELLAR COMETS**
S. V. M. Clube, ed. and B. McInnes, ed. 1982 66 p refs Conf. held at Edinburgh, 13-15 Apr. 1982
(ROE-OR-9; ISBN-0-902553-25-9; ISSN-0309-099-X) Avail: NTIS HC A04/MF A01

Measuring accurate positions of known comets which happen to occur on sky survey photographs, deliberately searching for and recovering distant periodic comets, and making occasional spectacular discoveries by chance are discussed. Author

**N83-18632*#** Iowa Univ., Iowa City. Dept. of Physics and Astronomy.
**NARROWBAND ELECTROMAGNETIC EMISSIONS FROM JUPITERS MAGNETOSPHERE Progress Report**
Donald A. Gurnett, W. S. Kurth, and F. L. Scarf (TRW Defense and Space Systems) 30 Sep. 1982 23 p refs Submitted for publication
(Contracts JPL-954013; JPL-954012; N00014-76-C-0016; Grants NGL-16-001-002; NGL-16-001-043; NAGw-337)
(NASA-CR-169851; NAS 1.26:169851; AD-A121616; U-OF-IOWA-82-28) Avail: NTIS HC A02/MF A01 CSCL 03/1

Recent studies of wideband plasma wave data from the Voyager 1 and 2 flybys of Jupiter have revealed the existence of narrowband radio emissions in the frequency range 1 -12 kHz. These narrowband emissions are very similar to narrowband emissions previously discovered in the magnetospheres of Earth and Saturn, and are believed to be produced by mode conversion from electron cyclotron waves near the upper hybrid resonance frequency. This mode conversion process is apparently one of

the basic mechanisms for generating planetary radio emissions. In this paper we describe the characteristics of the Jovian narrowband emissions and discuss possible mechanisms for generating these emissions. In this paper we describe the characteristics of the Jovian narrowband emissions and discuss possible mechanisms for generating these emissions. GRA

## 92 SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots.

**N83-18633#** Technische Univ., Graz (Austria). Inst. fuer Nachrichtentechnik und Wellenausbreitung.
**INFLUENCE OF THE SOLAR WIND MAGNETIC FIELD ON THE STRUCTURE OF THE MAGNETOSHEATH AND THE LOCATION OF THE MAGNETOPAUSE**
M. I. Pudovkin (Leningrad (A.A. Zhdanov) State Univ.) and M. F. Heyn Nov. 1981 34 p refs
(INW-8110) Avail: NTIS HC A03/MF A01

The variations of the plasma parameters and of the magnetic field in the vicinity of the stream line passing the subsolar point at the magnetopause are calculated using a special topology of the plasma flow which is the result of the formation of a stagnation line at the nose part of the magnetopause. The displacement of the magnetopause due to the penetration of the solar wind magnetic field is discussed. Author

**N83-18634#** Technische Univ., Graz (Austria). Inst. fuer Nachrichtentechnik und Wellenausbreithung.
**MAGNETOSHEATH'S PARAMETERS IN DEPENDENCE ON THE DIRECTION OF THE SOLAR WIND MAGNETIC FIELD**
M. I. Pudovkin (Leningrad (A. A. Zhdanov) State Univ.), M. F. Heyn, and V. V. Lebedeva (Leningrad (A. A. Zhdanov) State Univ.) Nov. 1981 19 p refs
(INW-8111) Avail: NTIS HC A02/MF A01

For abstract see (A82-47309).

## 93 SPACE RADIATION

Includes cosmic radiation and inner and outer earth's radiation belts.

For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics*.

No abstracts in this category.

## 99 GENERAL

**N83-18635#** Rockwell International Corp., Golden, Colo. Energy Systems Group.
**CHEMICAL-SYSTEMS ENGINEERING PROGRESS Progress Report, Jan. - Dec. 1980**
R. Jack Erfurdt, R. D. Howerton, ed., and L. M. Morales, comp. 3 Dec. 1981 119 p refs
(Contract DE-AC04-76DP-03533)
(DE82-010950; RFP-3175) Avail: NTIS HC A06/MF A01

Work in the fields of component development (corrosion, cleaning, packaging and containers, etc.) was summarized. Instrument systems pilot plant (decontamination, waste processing), and remote engineering are discussed. DOE

# SUBJECT INDEX



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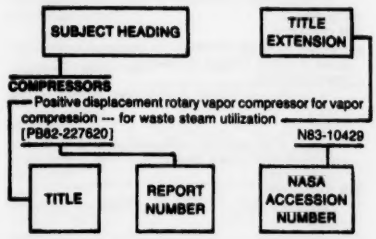


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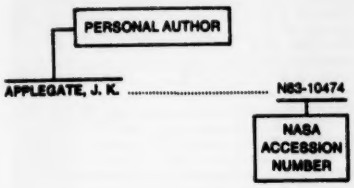


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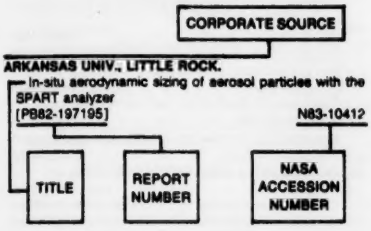


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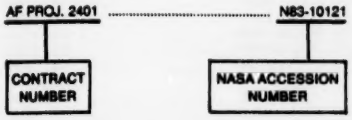


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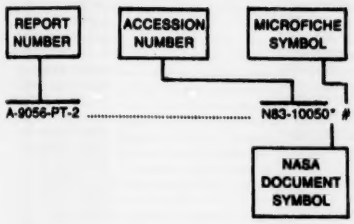


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